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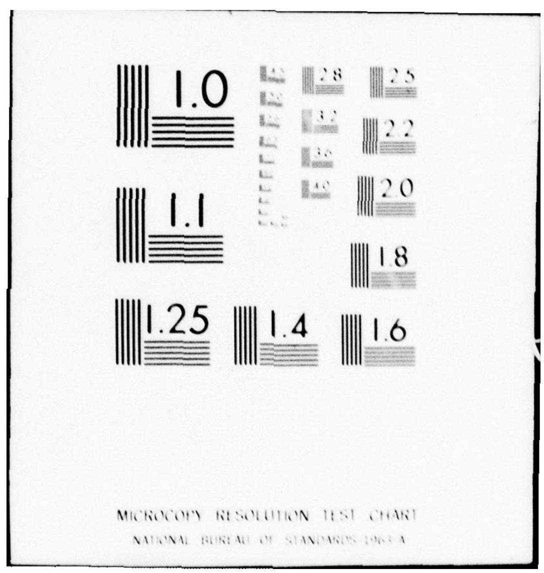
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LOGISTICS ASSESSMENT.

Volume I.

TEXT.

30 July 1976

Prepared for

U.S. AIR FORCE TEST AND EVALUATION CENTER
Kirtland Air Force Base
New Mexico 87115

Under Contract F29601-75-C-0134

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LOGISTICS ASSESSMENT

VOLUME I

30 JULY 1976

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ABSTRACT

Detailed guidance on logistics assessment, as applicable to the Air Force Test and Evaluation Center, is presented. The information presented provides information that will support the preparation for and performance of logistics assessment; present criteria in the areas of data requirements, collection, analysis, and reporting; and serve as a logistics assessment training guide.

FOREWORD

This regulation is divided into two volumes: a basic guidance document on logistics assessment (Volume I) and supporting appendixes (Volume II). The appendixes are numbered in a manner that keys them to the chapter and section of the text to which they apply. For example, appendix 4-2A is applicable to chapter 4, section 2; with the "A" in the appendix number denoting that the appendix is the first one referenced in that section.

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CHAPTER 1

INTRODUCTION

1-1. OBJECTIVES.

Objectives of this document are to provide information that will support the preparation for and performance of logistics assessment; present criteria in the areas of data requirements, collection, analysis, and reporting; and serve as a logistics assessment training guide. Much information pertaining to the evaluation of logistics factors is already available in Air Force regulations, manuals, reports, and texts. The purpose of this document is to combine the relevant portions of those numerous sources into a single reference for logistics assessment. Sheer volume precludes such a reference from being all-encompassing; therefore, supplementary sources of information are cited as appropriate throughout the text.

1-2. ORGANIZATION.

This document is organized into seven chapters with supporting appendixes. Subsequent sections of this introductory chapter discuss the basic approach to developing the document, and in using standardized terminology.

a. Chapter 2 addresses how this document can be utilized most effectively, i.e., who should use it and when.

b. Chapter 3 discusses specific applications to Operational Test and Evaluation (OT&E), the system development phase in which a realistic logistic assessment can first be conducted.

c. Chapter 4 presents the technical aspects of logistics assessment. That chapter:

(1) Defines logistics-related measures of effectiveness in terms of parameters, data elements, and definitions;

(2) Discusses cost-of-ownership and software considerations in logistics assessment;

(3) Presents data collection forms and formats, along with a summary of the data elements obtainable from each form;

(4) Discusses data sources and the impact of configuration management on test programs;

(5) Describes data reduction and analysis techniques, including criteria and ground rules and equations for the listed parameters;

(6) Outlines statistical techniques for logistics assessment;

(7) Discusses Air Force data systems and their products applicable to logistics assessment;

(8) Describes qualitative evaluation of test results applicable to logistics assessment, including the utility of these evaluations, test situations requiring these evaluations, and application of the qualitative process;

d. Chapter 5 (to be developed) will present practical applications of the techniques discussed in chapter 4.

e. Chapter 6 (to be developed) will provide standard Air Force reliability and maintainability terms.

f. Supplemental information (chapter 7) includes a listing of acronyms and abbreviations contained in this document, a reiteration of the major terms and definitions utilized, and a listing of documents used in preparing this document as well as references where additional information on selected subjects can be obtained.

g. The appendixes, which appear in a separate volume, provide information in support of the text of chapter 4.

1-3. DEVELOPMENT.

a. The amount of use received by a document is determined by what information it contains and how that information is presented. Two general methods of presentation are functional orientation and product orientation. The functional method utilizes a chronological ordering of the information, and provides an overall approach for using the material presented. The second method addresses the application of the material presented to specific items of interest. The functional approach was used in the development of this document, the primary reason being that the other approach requires an excessive repetition of material to cover the variety of end items that may undergo testing. Some product orientation has been provided through the use of matrices and the identification of information applicable to specific types of end items.

b. This document was developed through the following series of tasks;

(1) From a review of DoD and Air Force documents and special reports, the most widely used parameters for logistics assessment were collected.

(2) The data elements required to evaluate these parameters were determined.

(3) Data collection forms and formats that would provide the required data elements were identified.

(4) Criteria and ground rules for data reduction and analysis, and the equations for calculating the parameters were delineated.

(5) A review and analysis was performed on 10 Air Force data systems in terms of data sources, output products, and interfaces with other systems. Algorithms and equations associated with these systems were identified, and a description of qualitative evaluations, their utility, and application was prepared.

(6) Test reporting was addressed and supporting documentation compiled.

1-4. TERMINOLOGY STANDARDIZATION.

a. Considerable effort has been expended by DoD and the Air Force toward standardizing the terminology associated with the assessment of logistics performance. One product of this effort is MIL-STD-721B, Definitions of Effectiveness Terms. Many of the terms defined in that standard that relate to the description and evaluation of system effectiveness are also applicable to logistics assessment. The Air Force Logistics Command has developed a pamphlet, Logistics Performance Factors in Integrated Logistics Support (AFLCP 800-3), that identifies standard factors for use in quantifying logistics performance. During 1971, a joint AFLC-AFSC Panel 34 reported on an analysis of Air Force data systems to define the requirements for a single-thread data system, and recommended standard definitions for parameters and data elements associated with reliability and maintainability. Some recommendations were adopted. However, even today there are four different sources of data on maintenance man-hours per flying hour: the Maintenance Data Collection System (MDCS) as used at base level, the Command Aircraft Maintenance Manpower Information System (CAMMIS), AFLC's DO56 Product Performance System, and the Logistics Performance Measurement and Evaluation System (LPMES). All four sources provide different MH/FH values.

b. As a result of 14 December 1974 direction from Major General William R. Hayes, then Director of Maintenance Engineering and Supply, Headquarters USAF, a joint AFSC/AFLC/AFTEC reliability and maintainability (R&M) verification group was formed under the aegis of USAF/LGYE to focus the test and evaluation R&M efforts on operational requirements rather than just contract requirements. This dictated that agreement be reached on standard terms and definitions that would apply to both Developmental Test and Evaluation and Operational Test and Evaluation activities.

c. Terms, definitions, and computational procedures in chapter 4 are those in common use throughout the Air Force. Terms, definitions, and computational procedures in chapter 5 (to be developed) will be those applied by AFTEC to various types of test articles. Chapter 6 (to be developed) will contain the standard Air Force terms, definitions, and computational procedures to be applied incrementally to new test programs during the acquisition process. While certain terms within these chapters will be unique to the application being discussed, considerable commonality will be evident.

d. Terms are defined in this document, for clarity of understanding and completeness of information. The order of precedence in defining these terms was to use, first, those definitions published as standards by DoD and the Air Force; next, those recommended as standards; and finally, those considered test-program unique. In specific cases, special definitions were developed. Terms and definitions are provided throughout this document.

CHAPTER 2

DOCUMENT UTILIZATION

2-1. WHO SHOULD USE THE DOCUMENT.

a. This document was prepared for use primarily by Logistics Directorate (LG) personnel assigned to Operational Test and Evaluation (OT&E) programs. However, its utility is not limited to LG applications. The information contained herein provides a common framework for understanding of the logistics aspects of OT&E by other AFTEC directorates, as well as test team personnel from the major support and using commands. Personnel assigned to data collection, reduction, and analysis efforts will find useful information, as will those tasked to compile test results. The preponderance of information is directed toward performing the activities defined in AFTEC Regulation 55-1 for the Logistics Directorate. These activities include:

(1) Assist (in conjunction with the test director/deputy test director and test manager, the OT&E test team and Major Command (MAJCOM) personnel, as appropriate) in preparing the logistics sections of test plans/reports to ensure valid assessments of reliability, maintainability, availability, and logistics supportability of test articles.

(2) Review test plans and program documentation to ensure that:

(a) Requirements are defined and procedures are identified to provide a comprehensive reliability, maintainability, availability, and logistics supportability evaluation data base.

(b) Assistance is provided to collect and process data for cost of ownership and manpower assessments.

(c) Logistics support requirements and the methods for providing them are identified.

(3) Assist the test director/deputy test director and test managers in the selection of maintenance skills required for an effective test team.

(4) Assist the test director/deputy test director and test manager to ensure that logistics objectives have been achieved in conducting an Air Force Test and Evaluation Center (AFTEC) test program.

(5) Provide a member to the HQ AFTEC test team element for AFTEC-conducted test programs.

(6) Provide a member to the HQ AFTEC working group on an as-required basis for AFTEC-monitored test programs.

(7) Provide an LG member to the AFTEC review board.

(8) Assist the test team in review and analysis of test data and in the formulation of assessment comments concerning reliability, maintainability, availability, and logistics supportability of test articles.

2-2. HOW TO USE THE DOCUMENT.

a. The document is structured in a logical sequence for performing an overall logistics assessment. Its use can best be illustrated by a general discussion of Logistics Directorate activities associated with an OT&E program.

(1) Involvement begins when AFTEC is tasked to manage a test program. Early program efforts include the preparation, in conjunction with the operating and supporting commands, of OT&E inputs to the draft Test and Evaluation Objectives Annex (TEOA). The initial AFTEC-prepared document for the management of a program is the Test Program Outline (TPO). The Logistics Directorate may be involved in providing inputs to these documents. Section 4-2 provides a ready reference for identifying logistics parameters that may require evaluation. Additionally, that section identifies data elements associated with these parameters and presents definitions of the parameters and data elements.

(2) Detailed use of this document will generally start with the preparation of the Logistics Assessment Plan (LAP), which is usually an appendix to Annex E (Operational Suitability Test Procedures) of the AFTEC OT&E plan. The general contents of and the principles for developing the LAP are discussed in subsection 3-2c. The following paragraphs describe typical usage during the preparation of the LAP.

(a) Review program documentation for specific quantitative reliability, maintainability, availability, and supportability parameters to be evaluated during OT&E. If the required information is not available from this source, the using command should be asked to provide it.

(b) Review section 4-2 of this document to determine if additional parameters should be included.

(c) Itemize the logistics parameters to be evaluated.

(d) Determine which parameters (if any) are defined in the program documentation.

(e) Compare all program defined parameters with the definitions given in section 4-2.

(f) Use the definitions in section 4-2 as AFTEC standards, and resolve any conflicts between these and program definitions.

(g) Identify, from section 4-4, data elements required to calculate each parameter.

(h) Review forms already selected for test program usage to determine their data contents.

(i) Identify from section 4-3 the primary forms that will provide the required logistics data elements. Also review supplementary forms applicable to logistics testing.

(j) Indicate the data elements that must be collected on each form for logistics assessment.

(k) Select from section 4-4 the equations, applicable criteria, and ground rules for parameter evaluations.

(l) Review section 4-5 for applicability of the listed data systems for performing parameter calculations.

(m) Identify those calculations to be performed by the data systems and those to be performed manually.

(n) Determine which parameters can be expressed as point estimates and which must be expressed with confidence intervals.

(o) Stipulate from subsection 4-4e the statistical procedure for developing confidence intervals.

(p) During the program documentation review, qualitative logistics parameters should also be identified. Section 4-6 provides guidance in this regard. During the preparation of the LAP, the actions to be accomplished include:

1. Define each qualitative parameter and establish relative measures of effectiveness.

2. Prepare a comprehensive series of questions concerning each qualitative parameter. (These parameters may become subobjectives of the LAP, or more often will be considered factors listed under the methodology portion of a subobjective describing a measure of effectiveness to be evaluated by the data reduction and analysis procedures for that subobjective.)

3. Develop evaluation sheets, forms, or questionnaires for each qualitative parameter.

4. Prepare supplemental instructions (if required) for the completion and analysis of each evaluation sheet.

(3) Reporting for a specific OT&E effort will be influenced by the end item under test, the magnitude of the program, the military need for the end item, the intensity of Congressional and DoD scrutiny, and other significant factors. The OT&E plan will delineate the reports and briefings to be generated as a result of performing all tests. The details of the logistics assessment effort will usually comprise an annex to the final report. Test reporting requirements and formats are delineated in AFTEC Regulation 55-1.

2-3. DOCUMENT APPLICATIONS.

a. This document was developed as a support tool for OT&E. However, its uses are not limited to that particular activity. Early in a system development program, AFTEC should be providing inputs to the Decision Coordinating Paper (DCP), Program Management Plan (PMP), and Test and Evaluation Master Plan. These early documents have considerable impact throughout the life of the system. Much of the information in this document can be applied at any point in a program. Typical applications include:

(1) Identifying and defining logistics performance factors and parameters for inclusion in program documentation.

(2) Developing the logistics assessment appendix for the OT&E plan, including the methodology, data requirements, and data processing/analysis and evaluation portions in support of each objective/subobjective contained in the LAP.

(3) Developing the data collection, reduction, and analysis appendix for logistics performance factors in the OT&E plan.

(4) Identifying parameters and equations associated with selected Air Force data systems.

(5) Establishing data element requirements and parameter calculation procedures.

(6) Preparing data element collection procedures.

(7) Performing manual data analyses.

(8) Performing qualitative evaluations.

(9) Applying configuration management techniques.

(10) Applying statistical techniques.

(11) Preparing interim and final reports.

Basic information to support the above uses is presented herein. However, specific instructions are provided only for selected applications.

b. AFTEC involvement in a major Air Force system begins with the preparation of the OT&E portion of the initial Decision Coordinating Paper (DCP). Involvement in a nonmajor system usually starts with the preparation of a Program Memorandum (PM). Both the DCP and the PM serve as advocacy and direction documents in the management of the system development program. Major and designated nonmajor system programs are assigned to AFTEC for OT&E management. Other nonmajor programs are usually assigned to the MAJCOMs for OT&E management and monitored by AFTEC. All major system development programs and designated nonmajor programs receive the complete attention of the Defense Systems Acquisition Review Council (DSARC).

c. The four phases in the acquisition of a major system are the conceptual, validation, development, and production. The decision to implement the succeeding phase is made at the completion of the preceding phase. The types of efforts that AFTEC may perform during these phases include:

(1) Conceptual Phase – IOT&E objectives planning and test management planning as inputs to the DCP and DSARC 1 briefing.

(2) Validation Phase – Development of Test and Evaluation Objectives Annex (TEOA), test management planning, IOT&E test planning, conduct of IOT&E, preparation of IOT&E reports, and preparation of inputs to the DSARC 2 briefing.

(3) Development Phase – Review and updating IOT&E requirements, updating of IOT&E test plan, conduct of IOT&E, preparation of IOT&E reports, and preparation of inputs to DSARC 3 briefing.

(4) Production Phase – Development of Follow-on Operational Test and Evaluation (FOT&E) requirements, test management planning, FOT&E test planning, conduct of FOT&E, and preparation of FOT&E reports. FOT&E may continue through the deployment phase of the life cycle.

d. The information presented herein is applicable to all of the abovementioned phases during the planning, conduct, and reporting of AFTEC logistics assessment activities.

e. The utility of this document is not constrained to AFTEC logistics personnel. Other Air Force organizations may find it useful. The sections covering data elements, data systems, qualitative analysis, definitions, etc., make it a ready reference that may have applications to the planning and performance of other efforts. It also provides a basis for a common understanding of AFTEC's logistics assessment approach.

2-3. LIMITATIONS OF THIS DOCUMENT.

a. Provided herein are guidance and procedures for the general planning, conduct, and reporting of logistics assessment. Also presented is a selection of reference documents and supplemental information that will aid in the overall logistics assessment process. The uniqueness of each test program precluded the development of universally applicable detailed procedures. However, from the information presented, detailed procedures for specific applications can be generated.

b. Limited discussions are presented on cost of ownership, software assessment, and statistics. Cost of ownership assessment is detailed in a separate AFTEC document and only a brief summary is provided herein. Currently, software failures are treated similarly to hardware failures in that maintenance resources must be expended to return the end item to an operational condition. The assessment of software during OT&E requires the development of an approach, the establishment of techniques, the identification of data elements, and the preparation of procedures to implement the approach. A brief discussion on statistical techniques is supplemented by several reference documents that provide broad coverage of the subject.

CHAPTER 3

DOCUMENT APPLICATION TO OT&E

3-1. OPERATIONAL TEST AND EVALUATION.

a. The Air Force Test and Evaluation Center was established on 1 January 1974 as a separate operating agency to manage the Air Force's Operational Test and Evaluation (OT&E) Program. The concepts and policies outlined for test and evaluation in Air Force Regulation (AFR) 80-14, Test and Evaluation, are further defined by the mission policies presented in AFR 23-36, Air Force Test and Evaluation Center (AFTEC), and are implemented by the procedures detailed in AFTEC Regulation 55-1, AFTEC Operations Regulation.

b. OT&E is conducted to assess the military utility, operational effectiveness, and operational suitability of weapon systems, and to identify their deficiencies. In addition, OT&E provides information on organization, personnel requirements, doctrine, and tactics; and may provide data to support or verify material in operating instructions, publications, and handbooks.

c. During OT&E, the end item is subjected to an environment that approximates realistic operational conditions as closely as possible. Logistics factors of interest to AFTEC address those aspects of suitability comprising reliability, maintainability, availability, and supportability. Accordingly, the logistics evaluation must be based on operational parameters that will assess the standards of acceptability established by using and supporting commands. Parameters for logistics assessment should also be based on limits of acceptability established by these commands and detailed in program documentation.

3-2. TEST CONCEPTS AND PHILOSOPHY.

a. Life cycle cost (LCC) has become a significant factor in the acquisition of a system. Cost of ownership (a major LCC element) has been receiving particular attention since it may account for more than half of a system's life cycle cost. Logistics factors that influence cost of ownership include reliability, maintainability, availability, and supportability. An end item that fails often, even though easy to maintain and return to an operationally ready state, may not be effective because of its poor reliability. An end item that is difficult to maintain will exhibit poor availability characteristics. An end item that is awaiting repairs due to shortages of parts, support equipment, technical data or manpower may indicate supportability problems. The correction of these problem areas requires the expenditure of resources that directly affect cost of ownership. OT&E is the first phase in a system's life cycle where these logistics factors can be evaluated under an operational or near operational environment. The closer these conditions can be made to approach the "real world", the more accurate and valid a carefully planned and executed assessment will become. These evaluations, and their impact on future program decisions, are of great significance to the system under development.

b. The basis for the performance of any test program is to obtain an evaluation of end item operational characteristics with respect to specific criteria generated when the need for that end item was established. The test plan is the vehicle that translates a test concept into an organized approach for accomplishing a specific set of objectives within imposed constraints of time and resources. The size and complexity of a test program is determined by the nature of the system to be tested and the type of testing to be accomplished. OT&E of a major weapon system may require many separate tests, and the associated plan may be voluminous; while other testing may be well defined by a brief plan. This statement also applies to logistics testing and assessment.

c. Critical questions to be answered and areas of risk to be evaluated are usually stated in the Decision Coordinating Paper (DCP) or the Program Management Directive (PMD). These documents, along with the performance criteria, comprise the framework for developing the OT&E plan. The Logistics Assessment Plan (LAP) is an integral part of the overall test plan. The LAP must address the objectives of logistics assessment, delineate the specific logistics factors to be evaluated, present definitions and criteria, establish data requirements and methods of collection, specify data analysis and reduction techniques, provide computational procedures, detail test limitations, stipulate deviations from standard data systems, and discuss reporting requirements. In developing the LAP, the following principles should be applied:

(1) Identify specific test objectives. The objectives should address and provide answers to the critical questions, issues, and risk areas defined in the procurement documentation, and should contribute to the overall evaluation of the end item.

(2) Utilize clear difinitions, criteria, and procedures. Erroneous conclusions based on different interpretations of test results can be avoided by specifying these items for each test plan. Everyone is then using the same set of ground rules.

(3) Assure that the tests have meaning. Some measure of merit should be expressed by the using command for each significant parameter to serve as a basis for determining the adequacy of test results.

(4) Economize the effort. Utilize existing data systems when they satisfy assessment criteria. Whenever possible, simplify data requirements and use existing data forms and recording procedures.

(5) Utilize mutually supportive data collection efforts. Increased sample size may be obtained for IOT&E efforts through the selective use of Development Test and Evaluation (DT&E) data. However, extreme caution must be exercised in the use of DT&E data. Definitions, data reduction and analysis techniques, criteria and ground rules, etc., may differ significantly between these two test phases. Existing differences must be identified before any combining of data is attempted.

(6) Relate assessment efforts to the financial magnitude of the production decision. The importance of a decision should dictate the amount of information needed. A balance must be achieved between the cost of information leading to a decision and the commitment resulting from that decision. As the cost of the decision increases, so should the expenditure of test resources.

(7) Minimize the number of test program limitations imposed.

(a) During each test, make as many observations and exercise as much hardware as possible. Schedule the early participation of using command operations and maintenance personnel. Exert pressure to obtain early training, delivery of technical data, delivery of support equipment, and blue-suit hands-on maintenance at both the organizational and intermediate level.

(b) Maintainability demonstrations must be performed by trained Air Force personnel utilizing verified (IAW TO 00-5-1) technical data prior to the production decision. Technical data should be verified in time to permit completion of maintainability demonstrations prior to DSARC III. On the other hand, the technical data should not be verified too early, since the latest system and equipment configurations might not be available for the verification effort. Due to constraints on system and equipment availability, time phasing of technical data verifications and maintainability demonstrations must be carefully scheduled. However, planning must be flexible enough to accommodate systems, equipments, technical data, and personnel availability. In addition, Air Force personnel must be trained for the appropriate systems, equipment, and technical data prior to the verifications and demonstrations.

(8) Consider the source of test data. Biases may occur for many reasons in the documentation of data. Data reduction and analysis effort should consider the personnel involved and the circumstances surrounding the data collection activities. Where possible, built-in checks and balances should be imposed to limit data distortions.

(9) Assure that test results are comparable. From the earliest OT&E efforts through FOT&E, the procedures for collecting, analyzing, and reporting test results should remain the same. The effects of different end item configurations, changes in operating and maintenance personnel, training, etc., must be tracked. Comparisons should be made of test results before and after the changes occurred, and the impact of these changes should be assessed.

3-3. TEST DESIGN.

a. A format for the development and preparation of test plans, annexes, and appendixes is presented in chapter 4 of AFTEC Regulation 55-1, and the requirements for and general contents of the Logistics Assessment Plan (LAP) are discussed in chapter 12 of that regulation. In general, each test plan will be designed to answer a set of critical questions and issues that have been translated into objectives to be addressed by OT&E testing. These questions/issues/ objectives will have originated in various program documentation (DCP, PMD, PMP, etc.). The test design process results in the development of a plan for testing and answering these objectives, which may be supplemented, modified,

or sometimes even deleted as test planning proceeds. To assist in developing a test design, the following set of logistics objectives is provided as a general guideline for planning.

(1) Objectives.

(a) Test the reliability of the weapon system to include calculations of mean time between failures (MTBF), mean time between maintenance actions (MTBM), mean time between removals (MTBR), and operational reliability.

(b) Test the maintainability of the weapon system.

1. Test the quantitative maintainability factors of the weapon system to include calculations of maintenance man-hours per flying hour/operating hour/sortie (MH/FH); mean man-hours to repair (MMTR); turnaround time; percent of scheduled versus unscheduled maintenance actions; percent corrective maintenance actions versus support general maintenance actions; preventive maintenance actions versus product improvement maintenance actions; average discrepancies per inspection, by type of inspection; quick turnaround time; could not duplicate (CND) rate; and bench-checked serviceable rate.

2. Test the qualitative maintainability factors of the weapon system to include evaluations of accessibility, serviceability, and ease or difficulty of maintenance of its systems, subsystems, and components.

(c) Test the availability of the weapon system. Measure operationally ready rate of the weapon system and identify the major factors contributing to the nonoperationally ready conditions.

(d) Test the logistics supportability of the weapon system.

1. Test the adequacy, suitability, completeness, and correctness of technical data.

2. Test transportation and handling equipment and containers for suitability and compatibility with the weapon system, its components, and support equipment.

3. Test the adequacy of additional, new, or unique requirements for or modifications of facilities.

4. Test the adequacy of maintenance training, and refine determinations of training requirements to include training equipment, media, and facilities. (It is permissible to list this subobjective as a separate objective and not include it under logistics supportability.)

5. Test the adequacy of supply support and associated requirements.

6. Test the adequacy of maintenance personnel requirements for supporting and maintaining the weapon system.

7. Test the suitability of organizational and intermediate level ground support equipment (GSE).

(e) Test the adequacy of maintenance training, and refine determinations of training requirements to include training equipment, media, and facilities. (This element may be included under logistics supportability and not as a separate item.)

(f) Assess cost of ownership characteristics.

(2) Procedures. The test planning process must develop the procedures to be used to answer each objective/subobjective. These procedures will include:

(a) Method

(b) Data requirements

(c) Data processing/analysis

(d) Evaluation.

The above four procedural functions must be planned in detail during the test design to develop a comprehensive and workable test plan to satisfy the various logistics objectives.

b. Before procedures can be prepared in support of the LAP, detailed consideration must be given to the design of the tests to be performed. Answers should be obtained to various questions, such as:

(1) How many observations of each data element are required?

(2) How many times should the test be repeated?

(3) What factors of the test should be controlled?

(4) Can the number of test variables be reduced?

(5) What data collection techniques should be implemented?

(6) Should statistical techniques be applied to data reduction and analysis, and what should they be?

(7) What maintenance data collection system(s) are available?

(8) What forms are available?

(9) What contractor data will be available and how valid will it be?

c. Answers to the above and other significant questions will support the test design. That design is a structured approach for the conduct of an experiment and the evaluation of resulting data. The approach characterizes the test and provides much of the information necessary for its conduct. Elements of test design include the factors that may influence the outcome of the test. These elements comprise such items as the measurements to be taken, their sequence, the method by which they are to be taken, and the form and format for their recording. Each end item usually exhibits unique characteristics that preclude the development of a detailed universal approach to test design. The following discussion provides an overview of the test design process.

(1) From a review of the critical questions and issues to be evaluated, a set of major test objectives is derived. Usually these objectives are of a general nature and are often difficult to evaluate. Therefore they must be divided into a series of subobjectives, and in turn these subobjectives further divided until a set of criteria are available that can be assigned measures of effectiveness and evaluated by finite and collectable data. For logistics assessment, some of these efforts may have already been performed through the establishment of measures of merit for reliability, maintainability, availability, and supportability factors.

(2) The test design identifies the parameter(s) to be evaluated and outlines the conditions for test performance. The data elements required to evaluate each parameter are identified. Statistical techniques may be utilized to establish confidence limits and the number of data element observations required for each parameter. A balance must be achieved between the degree of certainty associated with the confidence limits and the time and resources available for test performance. Several iterations may be necessary to obtain an acceptable compromise. The test design may include a number of parameters, and it may be necessary to repeat the design process several times before all parameters of interest can be identified. Participation of a statistician in the test design process is highly desirable.

(3) Once an acceptable test design has been achieved, detailed procedures for conducting the tests should be prepared. These procedures should include, but not be limited in content to, paragraphs that:

(a) List objectives and detail the scope of the tests.

(b) Present the conditions under which the tests are to be performed.

(c) Delineate data requirements and the forms/formats for data collection.

(d) Identify the measurements associated with each data element.

(e) Delineate applicable definitions and criteria for data reduction and analysis.

(f) Stipulate data evaluation and computational criteria.

d. By following the above general procedures, the detailed planning will be completed for the conduct of the test. Results of that testing will be the satisfactory accomplishment of the logistics objectives, which will in turn answer the critical questions and issues contained within the program documentation. It can be seen then, that by undertaking a thorough and comprehensive logistics test design, the result is the development of a thorough and comprehensive test plan – the test design becoming, in its final form, the test plan.

CHAPTER 4

LOGISTICS ASSESSMENT

4-1. *INTRODUCTION.*

a. The level of logistics performance achieved for a system or equipment can be assessed only if appropriate information is available. The factors used for quantifying logistics performance are reliability, maintainability, availability, supportability, and cost of ownership. For each of these factors, one or more parameters or measures of effectiveness are associated with its evaluation. Examples of some of the major parameters utilized in assessing these factors are given in table 4-1a.

TABLE 4-1a. LOGISTICS PERFORMANCE FACTORS AND PARAMETERS

Factor	Typical Parameters
Reliability	Mean Time Between Failures
	Malfunction Occurrence Rates
	Mission Reliability
Maintainability	Mean Man-Hours to Repair
	Maintenance Man-Hours per Flying Hour
	Mean Time Between Maintenance Actions
	Not Operationally Ready Maintenance Rate
Availability	Operationally Ready Rate
	Item On-Line Time/Uptime
	Mean Time Between Failures
	Mean Time to Repair
	Not Operationally Ready Maintenance Rate
	Not Operationally Ready Supply Rate
Supportability	Reparable Repair Rate
	Requisition Fill Rate
	Not Operationally Ready Supply Rate
	Bench Check Serviceable Rate
	Mean Time Between Demands

b. The terminology appearing in this document is that currently in general use. However, parameters and data elements are explicitly defined herein so that there will be no misunderstanding concerning their meaning or application. Brief discussions are given on the topics of software, data sources, configuration management, and cost of ownership. Assessment of cost of ownership is covered in a separate AFTEC document*; however, cost-oriented data systems and their data elements are identified and summarized herein.

c. This portion of the document is organized to present the assessment criteria in a logical order. Parameters of interest and data elements are identified; forms for the collection of data elements are illustrated; data reduction and analysis techniques are discussed; data systems and their utility in providing assessment information are described; the value of qualitative evaluations is presented; and test reporting requirements are detailed.

4-2. MEASURES OF EFFECTIVENESS.

a. Measures of effectiveness are those quantitative and qualitative values associated with the assessment of logistics parameters, which provide information concerning the logistics characteristics of systems and equipments. Measures of merit are stated goals, operational needs, criteria, or standards associated with system or equipment requirements. Measures of effectiveness express the degree of attainment of the measures of merit. For example, a computed mean time between maintenance is a measure of effectiveness; a requirement of 50 hours MTBM in a DCP is a measure of merit.

b. During the preparation of the logistics assessment section of a test plan, several factors must be considered. First, existing program documentation should be reviewed to determine the critical issues, questions and test objectives that impact on logistics assessment; to identify the measures of merit required to evaluate logistics performance; and to establish the scope and limitations imposed upon the test program. Next, the structure of the logistics assessment efforts should be defined. Elements to be considered in this effort include:

(1) The performance of tasks assigned to AFTEC by AFR 23-36, AFR 80-5, and AFR 80-14.

(2) The utility of data and its applicability to carry over from IOT&E to operational deployment of the system.

(3) Measures of merit, reflecting user requirements, to determine if test results are satisfactory.

(4) Assessment efforts that relate to the financial magnitude of the decisions to be made.

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*AFTEC, Cost of Ownership Handbook

(5) The applicability to the test program of existing data systems, forms, and collection procedures.

(6) The use of clear definitions, criteria, and computational procedures to assure common understanding of test results.

c. Finally, the qualitative aspects of logistics assessment must be addressed. Opinions based on experience and engineering judgment will be needed. The adequacy of training for maintenance, the efficiency of fault detection procedures, and accessibility of equipment may require subjective evaluations.

d. The following paragraphs discuss each of the logistics factors presented in table 4-1a, the major parameters associated with each factor, and the data elements necessary to establish values for each parameter. Since there is an overlap of parameters among the logistics factors, these parameters will be defined only the first time they appear.

(1) Reliability.

Reliability can be expressed in a number of terms more useful to OT&E applications than the MIL-STD-721B definition. While these terms do not express reliability as the probability of an event happening under stated conditions, they do provide a relative measure of equipment reliability characteristics.

(a) Parameters.

Table 4-2a lists the major parameters associated with the assessments of operational or hardware reliability.

1. MTBF (which relates to hardware reliability) is an indicator of the failure characteristics exhibited by an item's population during its functioning life. Miles, cycles, events, or other units of life measurement can be substituted for time in this expression. The end result is the identification of a mean value with respect to failures of the item in question. The reciprocal of MTBF is failure rate (for the exponential distribution).

2. Malfunction occurrence rates indicate the design maturity of the end items, and reflect actual and/or potential equipment problems. Most malfunctions can be directly attributed to failures. However, they may also be an indication of interface or interaction problems with other equipment. A malfunction does not always mean that a failure has occurred; in many instances, reported malfunctions do not result in identified failures. It does mean that manpower was utilized in attempting to isolate a problem and to find a reason for the malfunction occurrence.

3. Through an examination of failure occurrences and when they were discovered, an indication is provided as to the adequacy and accuracy of examinations and inspections of the equipment. If the majority of failures are found during flight, inspection criteria could probably be improved to detect these problems prior to takeoff. This situation may also indicate that preflight and postflight checklists are not adequate. The primary purpose of maintenance actions is to keep aircraft operationally ready, and any parameter that provides an indication of problem areas is important.

TABLE 4-2a. RELIABILITY PARAMETERS

1.	Mean Time Between Failures (MTBF)
2.	Failure Rate
3.	Malfunction Occurrence Rates
	a. Total Maintenance Actions/1000 Flight Hours
	b. Aborts/1000 Flight Hours
	(1) Before Flight
	(2) In Flight
	c. Total Aborts/1000 Sorties Flown
	d. Failure Occurrences/1000 Operating Hours
4.	Percent Failures by When Discovered Code
	a. Before Flight
	b. In Flight
	c. Between Flights
	d. During Inspection
5.	Mission Reliability

4. Mission reliability is a measure of an item's capability to perform the mission or function for which it was designed. This probability is affected by the mission profile, which is a sequential and chronological description of the item's mission. Three principal factors that affect aircraft operation are altitude, speed, and duration. These factors have a significant influence on hardware performance and maintenance requirements, and therefore affect the outcome of a mission.

(b) Data Elements.

A number of studies have been conducted to evaluate existing Air Force data systems and their products. The final report of the Joint AFLC/AFSC Panel 34* summarized the requirements for a single thread data system for R&M assessments and presented numerous recommendations. Of significance were the recommendations to standardize terms, definitions,

*AFLC/AFSC, Reliability and Maintainability Single Thread Data System, Vol. I, dated 1 June 1971 (Panel 34).

and data elements; adopt common analytical techniques for data evaluation; and to implement a single-thread data system (STDS). Documentation review efforts have not disclosed the implementation status of these recommendations. However, selective use has been made of some recommended definitions and data elements, as well as those presented in DoD and Air Force documents in the preparation of this document. Table 4-2b presents a summary of data elements utilized for equipment identification and reliability assessment, and recaps the most widely used parameters calculated from these elements.

(c) Definitions.

The following definitions are applicable to reliability parameters and data elements.

1. Mean Time Between Failures (MTBF) – For a particular interval, the total operating life of a population of a part, component, subassembly, assembly, subsystem, or system divided by the total number of failures within the population during the measurement interval. This definition holds for operating time, flying time, sorties, event, or other measures of the life units to be applied when the system operational reliability is being evaluated. It is the average operating interval between malfunctions or degraded conditions requiring corrective maintenance.

2. Failure Rate – The number of failures of an item per unit measure of life (cycles, time, miles, events, etc., as applicable for the item). For equipment exhibiting an exponential failure distribution, this is the reciprocal of MTBF.

3. Malfunction Occurrence Rate.

a. Total maintenance actions/1000 flight hours are all occurrences reported under all valid how malfunctioned codes of type 1, 2, and 6, and action taken codes E, F, H, J, K, L, P, R, S, U, X, and Z. (See appendix 4-2A for information concerning these codes.)

b. Aborts/1000 flight hours are expressed as a rate based upon reported actions from the "on" equipment maintenance information. They are divided into ground and flight occurrences.

c. Total aborts/1000 sorties flown is expressed as a rate based upon actions from "on" equipment maintenance information covering when discovered codes A and C.

d. Failure occurrences/1000 operating hours is expressed as a rate based on the occurrences reported against equipment that operate over a time interval.

4. Percent Failures by When Discovered Code (DO56B5527).

a. Before-flight failure occurrences are accumulated for when discovered codes A and B as a fraction of total occurrences, and converted to a percentage.

TABLE 4-2b. RELIABILITY DATA ELEMENTS AND PARAMETERS

1. REQUIRED DATA ELEMENTS

a. Job Control Number/Report Number
b. Date, This Report
c. End Item (EI) Identification
d. Serial Number EI
e. Possessed Time EI
f. Time/Miles/Cycles/Events EI
g. Number of Landings EI
h. Date of Mission
i. Start of Mission (Time)
j. End of Mission (Time)
k. Mission Type
l. Operating Mode/Mission Phase
m. Time in Each Mode/Phase
n. Manufacturer Failed Item (FI)
o. Serial Number FI
p. Part Number FI
q. Time/Miles/Cycles/Events FI
r. Work Unit Code (WUC)
s. When Discovered Code, Date and Time
t. How Malfunctioned Code
u. Action Taken Code
v. Description of Problem
w. Corrective Action (Maintenance Action Taken)
x. Piece Parts Replaced
y. Manufacturer Installed Item (II)
z. Serial Number II
aa. Part Number II
ab. Time/Miles/Cycles/Events II
ac. Type Maintenance Code

2. CALCULATED PARAMETERS

a. Primary

1) Mean Time Between Failures (MTBF)
2) Failure Rates
3) Mission Reliability

b. Secondary

1) Total Maintenance Actions/1000 Flight Hours
2) Aborts/1000 Flight Hours
   a. Before Flight
   b. In Flight
3) Total Aborts/1000 Sorties Flown
4) Failure Occurrences/1000 Operating Hours
5) Percent Failures by When Discovered Code
   a. Before Flight
   b. In Flight
   c. Between Flights
   d. During Inspection

b. In-flight failure occurrences are accumulated for when discovered codes C and D as a fraction of total occurrences, and converted to a percentage.

c. Between-flight failure occurrences are accumulated for when discovered codes E, F, G, H, J, N, V, and 3 as a fraction of total occurrences, and converted to a percentage.

d. During-inspection failure occurrences are accumulated for when discovered codes K, M, P, Q, R, T, U, W, X, Z, 2, and 4 as a fraction of total occurrences, and converted to a percentage. Note that failures discovered during basic postflight, preflight, and home station check are identified in the between-flight category.

5. Mission Reliability – The percentage of attempted sorties flown without aborting.

6. Job Control Number/Report Number – A unique number assigned and used to control and tie together every related task needed to accomplish a job. Each related set of symptoms which comprises a single task or discrepancy is defined as a job. All actions taken to make the fix – whether on line or at a base shop, or shipment to a major repair facility – are considered part of the job and must carry the same number.

7. Date, This Report – Year, month, and day (may be written day, month, year) the report was initiated. This information is used in determining calendar time in completing the total actions relating to a single job control number (JCN), i.e., all actions from the line, base shop, and depot.

8. End Item (EI) Identification – An alphanumeric designator that identifies an item as a specific type, model, and series, or a specific mission, design, and series. This identification can be the same as the Standard Reporting Designator (SRD) used with data products from the Standard Base Supply System, U1050-II.

9. Serial Number EI – A unique number assigned to individual items within an end-item identification scheme.

10. Possessed Time EI – The time interval that an item is specifically assigned to an operational organization for the accomplishment of assigned missions.

11. Time/Miles/Cycles/Events EI – A record of the operating life of a serial-numbered end item in units of time, miles, cycles, events (as applicable for the item) at the time of failure or maintenance action.

12. Number of Landings EI – A record of the number of landings made by a specific aerospace vehicle.

13. Date of Mission – The year, month, and day a given mission was started.

14. Start of Mission (Time) – The clock time at the start of a given mission.

15. End of Mission (Time) – The clock time at the end of a given mission.

16. Mission Type – A unique code identifier for the type of mission being accomplished when a malfunction occurred.

17. Operating Mode/Mission Phase – A unique code identifying the mode of operation and/or mission phase during which the malfunction occurred.

18. Time in Each Mode/Phase – The time intervals that items operated in each mode or phase.

19. Manufacturer Failed Item (FI) – Identification of manufacturer by name or code as provided in the Federal Stock Catalog.

20. Serial Number FI – A unique number assigned to individual items within a functional group that distinguishes one item within that group from another.

21. Part Number FI – Manufacturer's number assigned to individual items of equipment, used in conjunction with manufacturer and serial number to track a selected item.

22. Time/Miles/Cycles/Events FI – A record of the operating life of a failed item.

23. Work Unit Code (WUC) – A five-digit coding structure that identifies an item on which maintenance is performed; usually assigned only to repair-cycle assets.

24. When Discovered Code, Data and Time – A unique code designed to identify the mode of operation or the phase of maintenance when a discrepancy is detected, along with the day, month, year, and clock time of the detection.

25. How Malfunctioned Code – A code that describes the physical defect of an item undergoing maintenance, as determined by the person performing the maintenance. This code is used by AFLC in conjunction with action taken codes to determine failures. At the base level, only how malfunctioned codes are used to identify failed items.

26. Action Taken Code – A code describing the type of maintenance action accomplished or in progress.

27. Description of Problem – A narrative description of a problem, addressing what comprises the malfunction.

28. Corrective Action (Maintenance Action Taken) – A narrative description of the maintenance actions performed to repair the failed item.

29. Piece Parts Replaced – A listing of the failed items removed from and replaced in an assembly to restore it to a functional condition. Only part numbered item(s) with a National Item Identification Number (NIIN) are listed.

30. Manufacturer, Installed Item (II) – Same as Item 19.

31. Serial Number II – Same as Item 20.

32. Part Number II – Same as Item 21.

33. Time/Miles/Cycles/Events (II) – A record of the operating life of an installed item.

34. Type Maintenance Code – A one-character code used to identify the type of work accomplished, such as scheduled or unscheduled maintenance.

(2) Maintainability.

Maintainability, as with reliability, can be expressed in a variety of terms that provide a useful measure of equipment maintenance characteristics.

(a) Parameters.

Table 4-2c lists the major parameters applicable to maintainability assessment.

1. Maintenance man-hours per flight, sortie operating hour, or other unit of life measurement provides an evaluation of the amount of maintenance required to keep an item operationally ready. This quantity can be broken down into the different levels at which maintenance is performed (organizational, intermediate, depot).

2. Mean time to repair (MTTR) provides an indication of the ease or difficulty associated with the performance of corrective maintenance. Reflected in MTTR are such factors as the accessibility of equipment and the adequacy of fault identification techniques, technical orders, and training. This parameter is usually expressed in clock hours. When expressed in man-hours, it becomes mean man-hours to repair (MMTR).

3. Mean time between maintenance (MTBM) is a measure of how often maintenance is performed. This evaluation includes on-equipment corrective actions only. The distribution of time among corrective actions provides an indication of equipment design features, and the relative impact of failures on the performance of maintenance.

4. Mean active downtime (MADT) is an index of the amount of time an equipment or item is not operational because of scheduled and unscheduled maintenance. This parameter, like MTBM, is an indication of equipment design features and their impact on logistics resources.

5. The Not Operationally Ready, Maintenance-Grounded (NORM-G) rate points up the efficiency of the overall maintenance cycle in terms

TABLE 4-2c. MAINTAINABILITY PARAMETERS

1. Maintenance Man-Hours per Flight Hour (MH/FH)
   a. On Equipment
   b. Off Equipment (shop)
   c. Total (sum of all maintenance man-hours)
2. Maintenance Man-Hours per Operating Hour (MH/OH)
   a. On Equipment
   b. Off Equipment (shop)
   c. Total
3. Mean Man-Hours to Repair (MMTR)
4. Mean Time to Repair (MTTR)
5. Mean Time Between Maintenance (MTBM)
6. Mean Active Down Time (MADT)
7. Not Operationally Ready, Maintenance (NORM) Rate
   a. NORM-Grounded (NORM-G) Rate
   b. NORM-Flyable (NORM-F) Rate
8. Not Repairable This Station (NRTS) Rate
9. Built-In Test Effectiveness
10. Actuarial Life Expectancy
11. Discrepancies-per-Inspection Rate
12. Percent Scheduled Inspection Man-Hours

of spares, spares location, personnel and training, support equipment, technical documentation, etc. This parameter also provides insight concerning equipment design features and their impact on logistics resources. The Not Operationally Ready, Maintenance-Flyable (NORM-F) rate indicates a reduced mission capability because one or more equipments are inoperative but the aerospace vehicle can still be flown. This condition is less severe than NORM-G, and allows for some testing to be performed with respect to logistics assessments.

6. Not Repairable This Station (NRTS) rate is another index that provides a relative measure of the off-equipment maintenance concept developed for the items under test. Its value as a parameter is based on action taken codes 2, 3, 4, 5, 6, and 7, which identify reasons for an NRTS action other than "repair not authorized". Comparisons are made between planned and actual NRTS actions to determine how well the planned maintenance approach is working.

7. Built-in test (BIT) effectiveness is a measure of how well the BIT hardware and software perform their fault detection and isolation functions with respect to malfunction/failure occurrences. This parameter has an impact on man-hour requirements, MTTR, MTBM, MADT and NORM.

8. Actuarial programs developed by the Air Force provide a forecast of expected failures based on usage and past failures. Actuarial life expectancy is based on the theory that items fail at various rates with respect to age. Once a failure pattern can be determined, actuarial mathematics is applied to develop the forecast. The technique is applicable to engines, auxiliary power units, certain helicopter components, and other equipment that exhibits a relationship between usage and aging. Actuarial life expectancy provides a method of looking at equipment to determine when removals should take place, and is a useful tool in the development and evaluation of overhaul and replacement cycles.

(b) Data Elements.

The parameters and data elements associated with maintainability were extracted from DoD and Air Force documents. Table 4-2d summarizes the elements utilized for equipment identification and maintainability assessments, and presents the parameters that can be calculated from these elements.

(c) Definitions.

The following definitions are applicable to maintainability parameters and data elements. (Definitions of parameters and elements common to reliability are not repeated.)

1. Maintenance Man-Hours/Flight Hour – The amount of direct maintenance labor expended per unit of time the aerospace vehicle is flown. This parameter may include all "support general" and "non-support general" man-hours, or only 03XXX and 04XXX coded support/non-support general manhours (see appendix 4-2A).

TABLE 4-2d. MAINTAINABILITY DATA ELEMENTS AND PARAMETERS

1. REQUIRED DATA ELEMENTS

a. Job Control Number/Report Number
b. Work Center
c. Date, This Report
d. Activity Identification
e. End Item (EI) Identification
f. Serial Number EI
g. Possessed Time EI
h. Time/Miles/Cycles/Events EI
i. Manufacturer Failed Item (FI)
j. Serial Number FI
k. Part Number FI
l. Time/Miles/Cycles/Events FI
m. Work Unit Code (WUC)
n. When Discovered Code, Date and Time
o. How Malfunctioned Code
p. Action Taken Code
q. Description of Problem
r. Corrective Action (Maintenance Action Taken)
s. Piece Parts Replaced
t. Units Completed
u. Manufacturer Installed Item (II)
v. Serial Number II
w. Part Number II
x. Time/Miles/Cycles/Events II
y. Air Force Specialty Code (AFSC)
z. Crew Size (by AFSC)
aa. Start Time (Maintenance)
ab. Stop Time (Maintenance)
ac. Delay Code (Maintenance)
ad. Support, General Maintenance
ae. Non-Support, General Maintenance
af. Type Maintenance Code

2. CALCULATED PARAMETERS

a. Primary

1) Maintenance Man-Hours/ Flight Hour
2) Maintenance Man-Hours/ Operating Hour
3) Mean Time to Repair (MTTR)
4) Mean Man-Hours to Repair (MMTR)
5) Mean Time Between Maintenance (MTBM)

b. Secondary

1) Mean Active Downtime
2) Not Operationally Ready, Maintenance-Grounded (NORM-G) Rate

b. Secondary (Cont)

3) Not Operationally Ready, Maintenance-Flyable (NORM-F) Rate
4) Not Repairable This Station, (NRTS) Rate
5) Built-In Test Effectiveness
6) Actuarial Life Expectancy
7) Discrepancies per Scheduled Inspection
8) Percent Scheduled Inspection Man-Hours

2. Maintenance Man-Hours/Operating Hour – The amount of direct maintenance labor expended per unit of time the equipment is operated.

3. MTTR – The total corrective maintenance time divided by the total number of corrective maintenance occurrences during a given period of time. This parameter is expressed in clock hours.

4. MMTR – The total corrective maintenance man-hours divided by the total number of corrective maintenance occurrences during a given time period.

5. Mean Time Between Maintenance – The mean of the distribution of the time intervals between maintenance actions.

6. Mean Active Downtime – The average clock hours between sorties when an aerospace vehicle is not flying, or the average clock hours that an end item is not operating because of scheduled and unscheduled maintenance, servicing, supply, and administrative delays.

7. Not Operationally Ready, Maintenance-Grounded (NORM-G) – The aerospace vehicle requires maintenance that must be performed (scheduled or unscheduled) prior to flight. This category includes the "look and fix" phase of maintenance inspection or Time Compliance Technical Order (TCTO), as well as after a preflight or thruflight inspection, home station check, or basic postflight inspection.

8. Not Operationally Ready, Maintenance-Flyable (NORM-F) – The aerospace vehicle can be flown, but is not capable of performing all of its command assigned missions due to one or more of its command designated systems or subsystems being inoperative. In addition, maintenance must either be in progress or have been deferred for reasons other than lack of parts or supplies.

9. Not Repairable This Station (NRTS) – A code for off-equipment actions that indicates reasons for not accomplishing repairs at the base-level maintenance facility. From a maintainability point of view, it represents maintenance man-hours expended in determining disposition of the item even though repair was not accomplished.

10. Built-In Test Effectiveness – The adequacy and accuracy exhibited by the BIT equipment with respect to detecting and isolating faults.

11. Actuarial Life Expectancy – The operating (flying) time that can be expected from an item before it fails, or before it must be removed and overhauled to bring it back to a like-new condition.

12. Discrepancies per Scheduled Inspection – The average number of discrepancies found during preflight, thruflight, basic postflight, phase, isochronal, or periodic inspection. It does not include discrepancies found during special inspections such as hard landing, saltwater exposure, etc.

13. Percent Scheduled Inspection Man-Hours – The percentage of total man-hours expended on scheduled inspections, i.e., preflight, thruflight, basic postflight, phase, isochronal.

14. Work Center – A five digit code that identifies organizational elements to which maintenance personnel are assigned, or location to which they may be dispatched.

15. Activity Identification – Identification of the base in possession of an item.

16. Units Completed – The number of like items worked on and actions completed for a given WUC.

17. Air Force Specialty Code (AFSC) – A unique identifier that indicates a person's area of specialization and skill level associated with that specialty.

18. Crew Size (by AFSC) – The number of maintenance personnel by Air Force Specialty Code performing a maintenance action.

19. Start Time (Maintenance) – The actual clock time, to the nearest 5 minutes, at which a maintenance action was initiated.

20. Stop Time (Maintenance) – The actual clock time, to the nearest 5 minutes, at which a maintenance action was terminated for more than 15 minutes.

21. Delay Code – A unique identifier indicating that a maintenance task has been delayed for some particular reason.

22. Support, General Maintenance – A coding structure that identifies support-type maintenance actions such as servicing, inspections, towing, washing, cleaning, corrosion prevention, handling, preservation, and depreservation of equipment, preparation of records and publications, and shop support functions. WUCs 01XXX through 09XXX are included in this category.

23. Non-Support, General Maintenance – A coding structure that identifies corrective maintenance actions on specific WUCs, as well as all other maintenance actions not classified as support type actions. Included are WUCs 11XXX through 99XXX.

(3) Availability.

Availability can be expressed by a number of parameters related directly and indirectly to reliability, maintainability, and supportability. These parameters indicate the capability of a system to support or sustain an operationally ready rate, utilization rate, or some other expression related to productivity.

(a) Parameters.

Table 4-2e lists the major parameters associated with availability.

1. Operationally ready rate is an expression of the availability of an item, and includes standby, alert, and mission time. This parameter reflects the fact that even though an aerospace vehicle is not performing a mission, it is in a condition to respond if called to do so and be capable of

TABLE 4-2e. AVAILABILITY PARAMETERS

1.	Operationally Ready Rate
2.	Aircraft Utilization Rate (Sortie Generation Rate)
3.	Item On-Line (Uptime)
4.	Item Standby Time
5.	Item Alert Time
6.	Item Downtime
	a. Scheduled
	b. Unscheduled
	c. Delay
7.	Mean Time Between Failures (MTBF)
8.	Mean Man-Hours to Repair (MMTR)
9.	Mean Time to Repair (MTTR)
10.	Not Operationally Ready, Maintenance (NORM) Rate
11.	Not Operationally Ready, Supply (NORS) Rate
12.	Mean Active Downtime

performing all assigned missions. Historically, availability has been expressed as a probability that an item is ready to operate at any point in time when used under stated conditions. The operational readiness concept is that either an item is operating satisfactorily or is ready to be placed in operation on demand when used under stated conditions. Thus, operational readiness provides a more comprehensive evaluation of the status of an item when considered along with utilization rates.

2. Aircraft utilization (sortie generation) rate is an indicator of the average flying hours, or sorties, for a specified time period. This factor is the one most important in developing the operationally ready rate because it represents the mission aspects of readiness; it also can be used to evaluate sortie planning versus actual accomplishments. Stating or measuring an operationally ready rate without considering the utilization rate has little value and can be misleading.

3. Item on-line (uptime) is the time that an end item is available to perform, or is performing, its intended mission. This parameter comprises standby, alert, reaction, and mission time if the end item is not expected to operate continuously except for maintenance and supply downtime.

4. Standby time is a measure of the time that an item is considered to be in an operating condition, but has not been completely activated to bring it to an alert status.

5. Alert time is a measure of the time that an item is considered to be in an operating condition and ready to perform its specified mission, but has not yet been called upon to perform its mission.

6. Downtime, when compared with total time (equipment hours per month), provides an evaluation of the percentage of time an item was not available for performing its mission. Downtime is composed of scheduled, unscheduled, and delay times associated with maintenance on the item.

7. The MTBF, MTTR, MMTR, and NORM parameters are also associated with reliability and maintainability, and were previously discussed.

8. The NORS-G rate is an indication of how often the item is unavailable because parts required from Supply could not be provided. This parameter is also associated with supportability. NORS-F is a less severe condition than NORS-G, and allows for some testing to be performed.

(b) Data Elements.

Data elements associated with availability were extracted from DoD and Air Force documents. Table 4-2f presents a summary of the elements utilized for equipment identification and available assessments, and indicates the most widely used parameters calculated from these elements.

(c) Definitions.

The following definitions are applicable to availability parameters and data elements. Previously defined parameters and elements will not be repeated.

1. Operationally Ready Rate – The fraction of time, within some specified calendar period, that an item is capable of performing all of its assigned missions.

2. Aircraft Utilization (Sortie) Rate – The fraction of time/sorties that an item is performing its assigned missions, within some specified calendar period.

3. Item On-Line (Uptime) – The interval of time during which an item is on standby, on alert, or reacting to or performing a mission.

4. Item Standby Time – The interval of uptime during which an item is in a specified operable condition but not fully activated.

TABLE 4-2f. AVAILABILITY DATA ELEMENTS AND PARAMETERS

1. REQUIRED DATA ELEMENTS

a. Job Control Number/Report Number
b. Work Center
c. Date, This Report
d. Activity Identification
e. End Item (EI) Identification
f. Serial Number EI
g. Possessed Time EI
h. Time/Miles/Cycles/Events EI
i. Number of Landings EI
j. Number of Sorties EI
k. Date of Mission
l. Start of Mission (Time)
m. End of Mission (Time)
n. Mission Type
o. Operating Mode/Mission Phase
p. Time in Each Mode/Phase
q. Time/Miles/Cycles, Events, Failed Item (FI)
r. Work Unit Code (WUC)
s. When Discovered Code, Date and Time
t. How Malfunctioned Code
u. Action Taken Code
v. Description of the Problem
w. Corrective Action (Maintenance Action Taken)
x. Piece Parts Replaced
y. Units Completed
z. Time/Miles/Cycles/Events, Installed Item (II)
aa. Air Force Specialty Code (AFSC)
ab. Crew Size (by AFSC)
ac. Start Time (Maintenance)
ad. Stop Time (Maintenance)
ae. Delay Code (Maintenance)
af. Support, General Maintenance
ag. Non-Support, General Maintenance
ah. Type Maintenance Code

2. CALCULATED PARAMETERS

a. Primary
   1) Operationally Ready Rate
   2) Aircraft Utilization Rate (Sortie Rate)

b. Secondary
   1) Item On-Line (Uptime)
   2) Item Standby Time
   3) Item Alert Time
   4) Item Downtime
      a) Scheduled
      b) Unscheduled
      c) Delay
   5) Mean Time Between Failures (MTBF)

b. Secondary (Cont)
   6) Mean Time to Repair (MTTR)
   7) Not Operationally Ready, Maintenance-Grounded (NORM-G) Rate
   8) Not Operationally Ready, Maintenance-Flyable (NORM-F) Rate
   9) Not Operationally Ready, Supply-Grounded (NORS-G) Rate
   10) Not Operationally Ready, Supply-Flyable (NORS-F) Rate
   11) Mean Active Downtime

5. Item Alert Time – The interval of uptime during which an item is in a specified operable condition awaiting a command to perform its assigned missions.

6. Item Downtime – The interval of time during which an item is not in a condition to perform its assigned mission. It comprises scheduled, unscheduled, and delay times associated with maintenance actions.

7. NORS-G – The aerospace vehicle is not capable of flight due to a verified lack of parts. This condition is applicable only if a NORS demand has been placed on supply and verified in accordance with standard procedures.

8. NORS-F – The aerospace vehicle can be flown, but is not capable of performing all of its Command-assigned missions due to one or more of its Command-designated systems or subsystems being inoperative; and parts are required to return it to fully operational status. This condition must be verified, as for a NORS-G designation.

9. Number of Sorties EI – The cumulative number of flights of a single aerospace vehicle.

(4) Supportability.

Supportability can be evaluated by a number of parameters that measure the adequacy of the support developed for a system. It is basically depicted by the relationship between the demand for and the availability of logistics resources for deployment of a new system. Values of parameters associated with supportability will not usually be identified in program documentation. However, information can be obtained from similar systems in operation to gain insight as to relative values of selected parameters. Supportability assessments will require both quantitative and qualitative information.

(a) Parameters.

A list of the major parameters is presented in table 4-2g.

1. Repair capability is a measure of the number of off-equipment maintenance actions that can be accomplished at base level; and repair rate is a measure of how many actions can be performed in a given time. Bench check serviceable rates and could-not-duplicate rates are measures of how often equipments are removed and replaced when there appear to be problems, but these problems are not verifiable under detailed checkout. Mean time between demands, cannibalization rates, and requisition fill rates are indicative of the adequacy of the supply system in terms of how often repair parts are requisitioned from supply, and to what degree these requisitions are fillable from on-hand stock. AGE utilization rates, support equipment, maintenance man-hours, and precision measuring equipment (PME) no-defect rates are all influenced by management decisions concerning the support-type equipment to be used in system maintenance.

2. For the most part, assessment of qualitative parameters for supportability will rely on available information concerning similar deployed

TABLE 4-2g. SUPPORTABILITY PARAMETERS

1. Quantitative

   a. Repair Capability

   b. Reparable Repair Rates

   c. Bench Check Serviceable Rates

   d. Could not Duplicate Rates

   e. Not Operationally Ready, Supply (NORS) Rates

   f. Mean Time Between Demand (MTBD)

   g. Aerospace Ground Equipment (AGE) Utilization Rates

   h. Support Equipment Maintenance Manhours

   i. Precision Measuring Equipment (PME) No Defect Rates

   j. Requisition Fill Rates

   k. Cannibalization Rates (cannibalizations per sortie)

2. Qualitative

   a. Maintenance Plan and Support Concept Adequacy

   b. Supply Support Adequacy

   c. Transportation/Handling Adequacy

   d. Technical Data Adequacy

   e. Test and Support Equipment Adequacy

   f. Support Facilities Adequacy

   g. Training Adequacy

   h. Initial and Replacement Spares Adequacy

   i. Configuration Management Adequacy

systems and judgments based on previous experiences of test team members. General guidance concerning evaluation of qualitative parameters is presented in section 4-6.

(b) Data Elements.

The data elements required to identify equipment and calculate quantitative supportability parameters are the same as those associated with reliability, maintainability, and availability parameters, and will not be repeated in this section.

(c) Definitions.

1. Repair Capability – The percentage of components delivered to the base-level maintenance functions for repair that are actually repaired (repaired units plus action taken codes 2 through 6).

2. Reparable Repair Rate – The percentage of components assigned to base-level maintenance for repair that are actually repaired (repaired units plus action taken codes 1 through 9).

3. Bench Check Serviceable Rate – The percentage of items removed from the end item for which the suspected failure was not confirmed during bench check using available skills, test equipment, and technical data.

4. Could Not Duplicate Rate – The percentage of reported on-equipment malfunctions checked and found to require no further maintenance action.

5. Mean Time Between Demand – The average operating time between removal of components for suspected failure, with failure confirmed during bench check.

6. AGE Utilization Rate – The average hours per month that aerospace ground equipment is operated.

7. Support Equipment Maintenance Man-Hours per Operating Hour – The direct maintenance labor spent on maintenance of support equipment (AGE) per unit of equipment operating time.

8. Precision Measuring Equipment (PME) No Defect Rate – The percentage of instances that PME are found to be defect-free during scheduled calibration, compared with the total number of PMEs calibrated over some time span.

9. Requisition Fill Rates – The percentage of instances that requisitions for components, modules, repair parts, consumables, etc., are filled by base supply within prescribed time limits, compared with the total number of requisitions presented to base supply over some finite time span (weeks, months, etc.).

10. Cannibalization Rate – A measure of the cannibalization actions performed per sortie to keep end items in an operationally ready condition.

11. Maintenance Plan and Support Concept Adequacy – How well the maintenance plan and support concept fulfill the needs of an end item to sustain an operationally ready rate.

12. Supply Support Adequacy – The capacity of supply support planning and implementation to sustain base-level maintenance requirements.

13. Transportation/Handling Adequacy – The sufficiency of the planning and implementation factors associated with transportation, packaging, and handling to satisfy end item support requirements.

14. Technical Data Adequacy – Adequacy of technical data to support end item maintenance and operation.

15. Test and Support Equipment Adequacy – The capability of test and support planning and equipment to sustain end item operations.

16. Support Facilities Adequacy – The capacity of available support facilities to sustain end item operation.

17. Training Adequacy – The sufficiency of the training received or planned for operation, checkout, and maintenance of an end item.

18. Initial and Replacement Spares Adequacy – The sufficiency, with respect to sustaining an end item operationally-ready-rate, of planned and implemented initial and replacement parts stockage levels for maintenance and repair. (May be considered an element of Supply Support, Item 12.)

19. Configuration Management Adequacy – The adequacy of the configuration management planning and the practices developed and implemented for an end item.

(5) Cost of Ownership Summary.

(a) Cost of ownership (COO) is defined as the total cost of operations, maintenance, and support for an end item over the build-up period plus a 10-year operational period. COO excludes development, acquisition, and disposal cost. Applicable directives are AFR's 23-36, 80-14, and 800-11.

(b) AFTEC has published a Cost of Ownership Handbook that provides detailed guidance for assessing the ownership cost of a variety of end items. This document delineates and defines cost elements, discusses the cost element parameters, lists cost data sources, and identifies equations for cost element calculations.

(c) COO assessments by AFTEC are designed to complement and enhance the existing Air Force management and cost estimating functions. This is generally accomplished by providing information collected during OT&E which will permit:

1. Refining the official program operating and support (O&S) cost estimates.

2. Identifying system characteristics or deficiencies which significantly impact the cost of ownership.

(d) Concerning the first objective (refinement of O&S costs), AFTEC will use the official O&S cost estimates, prepared by cost analysis offices and independent cost analysis (ICA) teams, as the basis for obtaining and providing information. During OT&E, AFTEC will endeavor to acquire test information that might bring the cost estimates more in line with future operational experience via analysis of test sensitive elements outlined below. The O&S cost estimates referred to are based principally upon methodology of the Air Force Cost Analysis Cost Estimating (CACE) model, which is described in the CAIG Cost Development Guide, May 1974. Similar guides are being developed for non-aircraft systems. The elements of these estimates where AFTEC can provide greatest assistance are:

1. Base aircraft maintenance manpower

2. Base munitions maintenance manpower

3. Aviation POL

4. Base aircraft maintenance material

5. Replenishment spares

6. Common support equipment.

(e) These will be areas of principal concentration. In addition, assessments of maintenance manpower costs will focus on results obtained by the Logistics Composite (LCOM) model, or other manpower determination methods. Assessments will project requirements/costs for the time periods of initial equippage and for mature systems. To assist in meeting the objective of O&S cost refinement the following will apply:

1. Program offices plus AFSC and AFLC comptroller cost analysis offices will furnish AFTEC with O&S cost estimates for these systems in, or scheduled for, OT&E including supporting rationale for each cost element.

2. AF/ACM will furnish AFTEC with O&S cost estimates for each new system as the estimates are developed and refined. The information provided will include adequate detail on the methodology and assumptions to permit AFTEC construction of cost elements.

3. In the interests of standardization, the cost analysis offices and independent cost analysis teams will include those O&S cost elements described in the CAIG Cost Development Guide as a part of their life cycle cost estimates. The use of these elements allows for a consistent approach to assessments and further permits test planners to structure data collection efforts to ensure that correct data is collected during OT&E.

4. AFTEC will provide information to AF/ACM, AF/PRM, AFSC and AFLC to use in refining estimates and performing independent cost analyses, including information on significant cost that may not have been included in the estimates, if any become apparent.

(f) Concerning the second objective (identifying system characteristics), AFTEC will endeavor to obtain and provide information to the implementing, supporting and using commands which will assist them in quantifying and evaluating relative O&S cost impacts attendant to specific equipment characteristics or deficiencies. Normally, this information will be similar to reliability and maintainability parameters already needed to evaluate operational suitability of the system. To enable AFTEC to satisfy this objective the implementing, supporting, and using commands will furnish AFTEC adequate information concerning the O&S cost estimating models and techniques to be used by them during the program, and specific information requirements and O&S cost baselines, before OT&E begins. In the absence of this information, AFTEC will assume use of the AFLC logistics support cost model and obtain data to utilize this model for principal elements of the system. If it is useful to cite relative O&S cost impacts associated with a particular element of the system to establish deficiency, these costs will be reflected in formal evaluation reports. However, the principal emphasis will be upon providing information to agencies for cost of ownership estimates. Participating commands in OT&E will assist AFTEC in accomplishing the cost of ownership objectives.

(6) Software and Measures of Effectiveness.

(a) Software performance has a significant impact on the results of a test and evaluation project. Current data systems provide a limited capability for reporting and evaluating software. Although some how malfunctioned codes have been established for computers and software, the work unit codes and action taken codes are hardware oriented. It is possible to obtain a data sort on these how malfunctioned codes, but there is no way of determining whether hardware or software caused the problem. For example, during bench check of a computer the components are replaced and software is reloaded. A component failure could have erased or changed the computer program, or a faulty program could have overloaded one or more electronic parts. Even if the technician can determine the cause, he has no way of adequately coding his findings. In all probability it will be listed as a hardware problem. On AFTO form 349 he can supplement the coding system with a narrative description of what was found and what was done to make the repairs. To perform any type of software evaluation would require a visual review of each form associated with computer maintenance, and a manual scorekeeping effort of those failures attributed to software.

(b) Both hardware and software failures impact on all logistics parameters. One of the primary objectives of a test and evaluation effort is to assess these parameters under actual operating conditions. It is desirable to evaluate software separately from hardware. However, techniques and specific data requirements must be developed to perform software evaluations in an OT&E environment. Until these techniques are available, hardware and software failures should be treated in a similar manner. Both should be included in the calculations of parameters for overall end item assessment. This approach does not provide for a separate software assessment but does include the impact of software on end item performance during OT&E.

4-3. DATA COLLECTION.

a. The importance of the data collection task for logistics assessment cannot be overemphasized. Both the quantity and quality of the information impacts on the results obtained from the test effort. Air Force-developed forms and collection procedures appear to be adequate for the majority of data elements needed for logistics evaluations. However, some selected cases may require adaptation or modification of these forms and procedures.

b. This section addresses obtaining the data elements defined in section 4-2. A number of data forms available for logistics evaluations are illustrated, their applicability to different hardware types is discussed, and guidance documentation for the use and preparation of these forms is referenced. Data elements available from selected forms are identified, as well as data sources available for comparison purposes.

(1) Data Forms.

Within the Air Force are numerous forms for recording and documenting data and information. A review of many of these forms indicates that they fall into two general categories: those providing primary data with respect to hardware assessment, and those providing supplemental information concerning hardware, technical data, and personnel. In many cases information is contained on both sides of a form. Some examples of forms provided in this section show only the front side to identify that specific form. However, where significant information is documented on the reverse side, both sides are shown. The technical orders and manuals that contain reporting instructions indicate whether they are one- or two-sided forms. Table 4-3a presents a matrix of primary forms and their applicability to various hardware types. The following paragraphs discuss each of the forms listed in that table.

(a) AFTO Form 349 — Maintenance Data Collection Record. (Figure 4-3a)

This form is the Air Force's universal source of maintenance data for all types of hardware. It is limited with respect to providing logistics assessment information in that it must be used in conjunction with additional forms to obtain all required data. The possible combinations of forms that can be used to supplement form 349 is almost unlimited, depending upon the hardware under evaluation. Therefore the choice of forms to be used must be based upon the particular system to be evaluated and the type of analysis involved. Specific instructions for completion of this form are contained in Technical Orders 00-20-2, 00-20-2-2, 00-20-2-4 through 00-20-2-8, 00-20-2-10, and 00-20-2-13. Each of these technical orders addresses specific hardware applications and information content pertaining to the form.

TABLE 4-3a. MATRIX OF PRIMARY FORMS AND THEIR HARDWARE APPLICABILITY (Sheet 1 of 2)

Primary Air Force Form	Hardware Applicability										
	Aircraft	Missiles, Air Launched	Missiles, Ground Launched	ICBM	AGE/SE	Ground CEM	Trainers/Simulators	Drones	Engines	PME	Munitions (Non-Nuclear)
AFTO Form 349, Maintenance Data Collection Record	X	X	X	X	X	X	X	X	X	X	X
AFTO Form 350, Item Processing Tag	X	X	X	X	X	X	X	X	X	X	X
AFSC Form 258, Maintenance Discrepancy/Production Credit Record	X	X	X	X	X	X	X	X	X	X	X
AFFTC Form 300, Aircraft Debriefing Record	X										
AFTO Form 781, Aerospace Vehicle Flight Data Document	X	X						X			
AFTO Form 781A, Maintenance Discrepancy and Work Document	X	X						X	X		
AFTO Form 781E, Accessory Replacement Document	X							X	X		
AFTO Form 781F, Flight and Maintenance Record	X							X			
AFTO Form 781H, Flight Status and Maintenance Document	X	X						X	X		
AFTO Form 781J, Engine Flight Document	X							X	X		

TABLE 4-3a. (Sheet 2 of 2)

Primary Air Force Form	Hardware Applicability: Aircraft	Missiles, Air Launched	Missiles, Ground Launched	ICBM	AGE/SE	Ground CEM	Trainers/Simulators	Drones	Engines	PME	Munitions (Non-Nuclear)
AFTO Form 781K, Inspection and Delayed Discrepancy Document	X	X						X	X		
AF Form 1534, Engine Status Report	X							X	X		
AFTO Form 4, Operating Report	X	X	X								
AFTO Form 208, Component Replacement Record	X		X		X	X	X	X	X		
AFTO Form 443, Trainer/ AGE Status and Operating Record					X		X				
AFTO Form 444, Trainer/ AGE Maintenance Record					X		X				
AFTO Form 454, Nonpowered AGE Record					X		X				
AFTO Form 136, Precision Measuring Equipment Record										X	
AFTO Form 210E, On Equipment Support, etc.						X					
AF Form 2445, Job Control Document	X	X	X	X	X	X	X	X	X	X	X
AF Form 359, Aerospace Vehicle Data Card	X	X	X				X				
AF Form 359a, Aerospace Vehicle Data, Manual	X	X	X				X				

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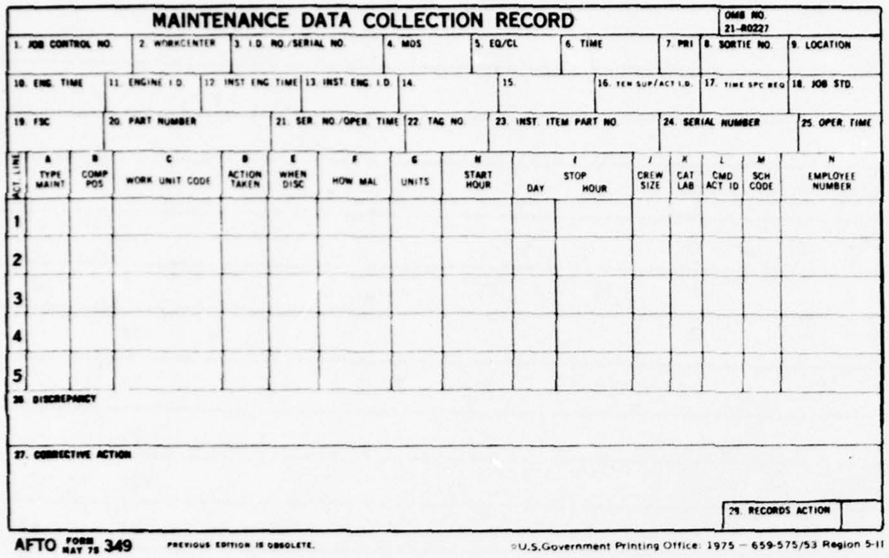
MAINTENANCE DATA COLLECTION RECORD

OMB NO. 21-R0227

1. JOB CONTROL NO. | 2. WORKCENTER | 3. I.D. NO./SERIAL NO. | 4. MDS | 5. EQ/CL | 6. TIME | 7. PRI | 8. SORTIE NO. | 9. LOCATION

10. ENG. TIME | 11. ENGINE I.D. | 12. INST ENG TIME | 13. INST. ENG. I.D. | 14. | 15. | 16. TEN SUP/ACT I.D. | 17. TIME SPC REQ | 18. JOB STD.

19. FSC | 20. PART NUMBER | 21. SER. NO./OPER. TIME | 22. TAG NO. | 23. INST. ITEM PART NO. | 24. SERIAL NUMBER | 25. OPER. TIME

ACT LINE	A TYPE MAINT	B COMP POS	C WORK UNIT CODE	D ACTION TAKEN	E WHEN DISC	F HOW MAL	G UNITS	H START HOUR	I STOP DAY	I STOP HOUR	J CREW SIZE	K CAT LAB	L CMD ACT ID	M SCH CODE	N EMPLOYEE NUMBER
1															
2															
3															
4															
5															

26. DISCREPANCY

27. CORRECTIVE ACTION

28. RECORDS ACTION

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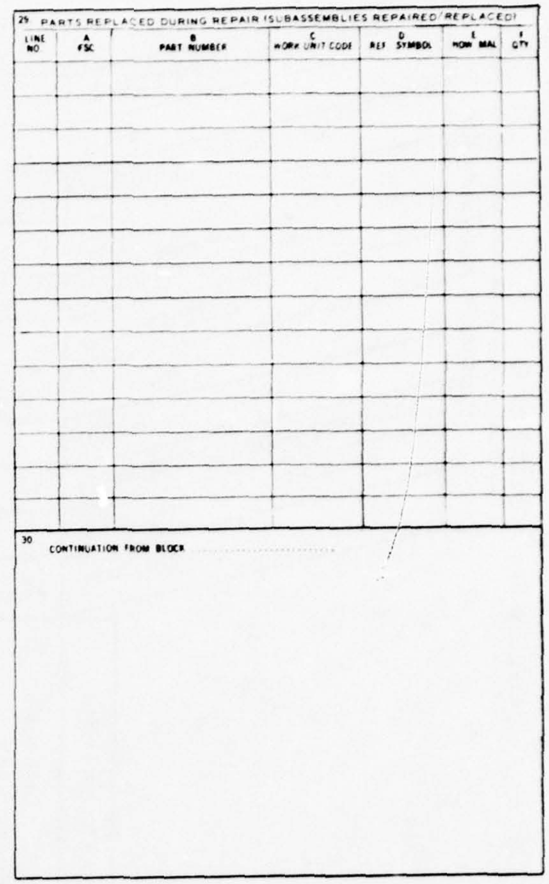

29. PARTS REPLACED DURING REPAIR (SUBASSEMBLIES REPAIRED/REPLACED)							
LINE NO	A FSC	B PART NUMBER	C WORK UNIT CODE	REF	D SYMBOL	E HOW MAL	F QTY

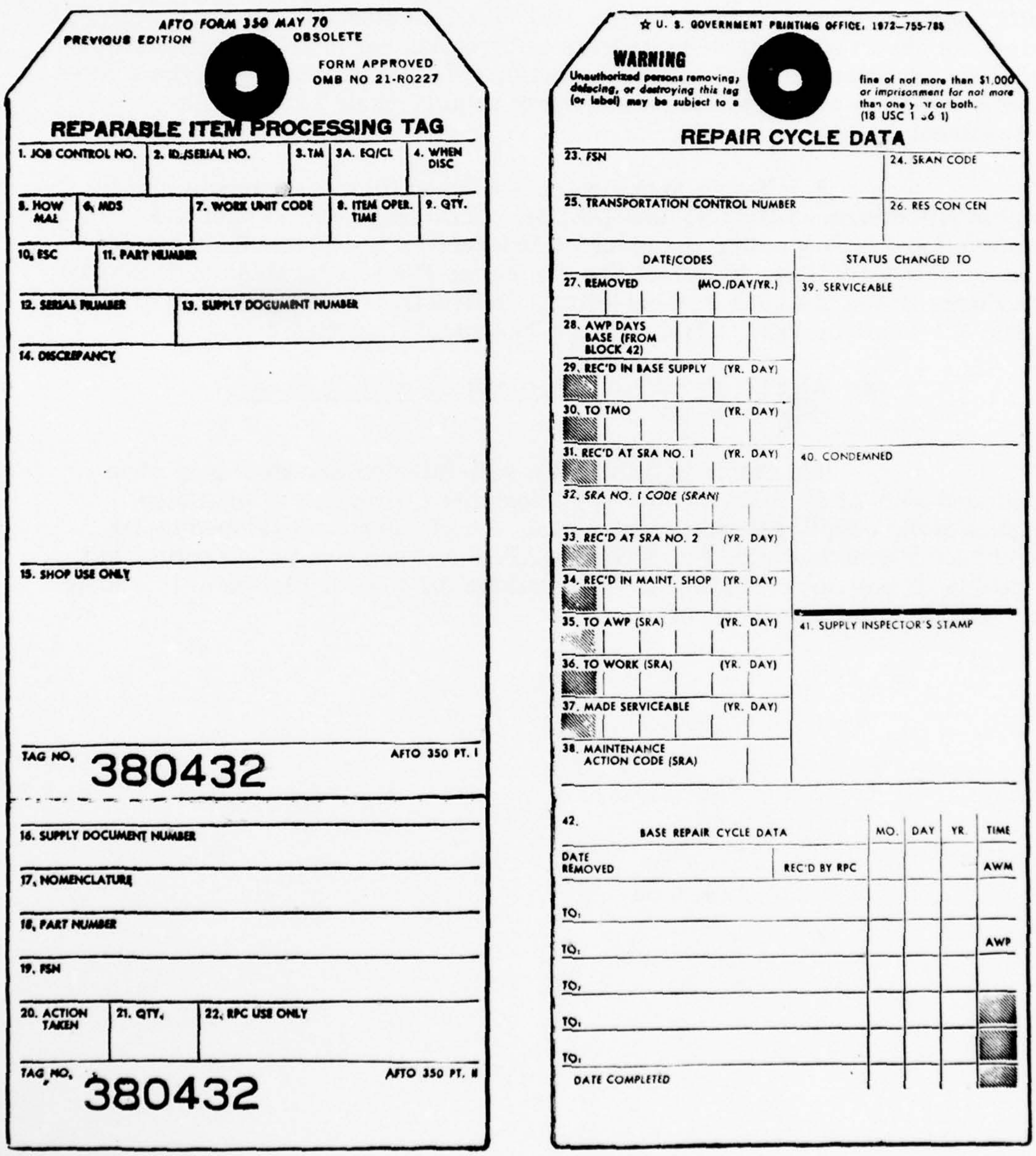
30 CONTINUATION FROM BLOCK

Back

Figure 4-3a. AFTO Form 349

(b) AFTO Form 350 — Reparable Item Processing Tag. (Figure 4-3b)

This form is used with form 349 for all reparable items removed from a system. It remains with the item until that item is disposed of (serviceable or condemned). The same technical orders for form 349 apply to this form.



AFTO FORM 350 MAY 70
PREVIOUS EDITION OBSOLETE
FORM APPROVED
OMB NO 21-R0227

REPARABLE ITEM PROCESSING TAG

1. JOB CONTROL NO. | 2. ID./SERIAL NO. | 3. TM | 3A. EQ/CL | 4. WHEN DISC
5. HOW MAL | 6. MDS | 7. WORK UNIT CODE | 8. ITEM OPER. TIME | 9. QTY.
10. ESC | 11. PART NUMBER
12. SERIAL NUMBER | 13. SUPPLY DOCUMENT NUMBER
14. DISCREPANCY
15. SHOP USE ONLY
TAG NO. 380432 AFTO 350 PT. I
16. SUPPLY DOCUMENT NUMBER
17. NOMENCLATURE
18. PART NUMBER
19. FSN
20. ACTION TAKEN | 21. QTY. | 22. RPC USE ONLY
TAG NO. 380432 AFTO 350 PT. II

☆ U. S. GOVERNMENT PRINTING OFFICE: 1972—755-788

WARNING
Unauthorized persons removing, defacing, or destroying this tag (or label) may be subject to a fine of not more than $1,000 or imprisonment for not more than one year or both. (18 USC 1361)

REPAIR CYCLE DATA

23. FSN | 24. SRAN CODE
25. TRANSPORTATION CONTROL NUMBER | 26. RES CON CEN

DATE/CODES | STATUS CHANGED TO
27. REMOVED (MO./DAY/YR.) | 39. SERVICEABLE
28. AWP DAYS BASE (FROM BLOCK 42)
29. REC'D IN BASE SUPPLY (YR. DAY)
30. TO TMO (YR. DAY)
31. REC'D AT SRA NO. 1 (YR. DAY) | 40. CONDEMNED
32. SRA NO. 1 CODE (SRAN)
33. REC'D AT SRA NO. 2 (YR. DAY)
34. REC'D IN MAINT. SHOP (YR. DAY)
35. TO AWP (SRA) (YR. DAY) | 41. SUPPLY INSPECTOR'S STAMP
36. TO WORK (SRA) (YR. DAY)
37. MADE SERVICEABLE (YR. DAY)
38. MAINTENANCE ACTION CODE (SRA)

42. BASE REPAIR CYCLE DATA | MO. | DAY | YR. | TIME
DATE REMOVED | REC'D BY RPC | | | | AWM
TO:
TO: | | | | AWP
TO:
TO:
TO:
DATE COMPLETED

Figure 4-3b. AFTO Form 350

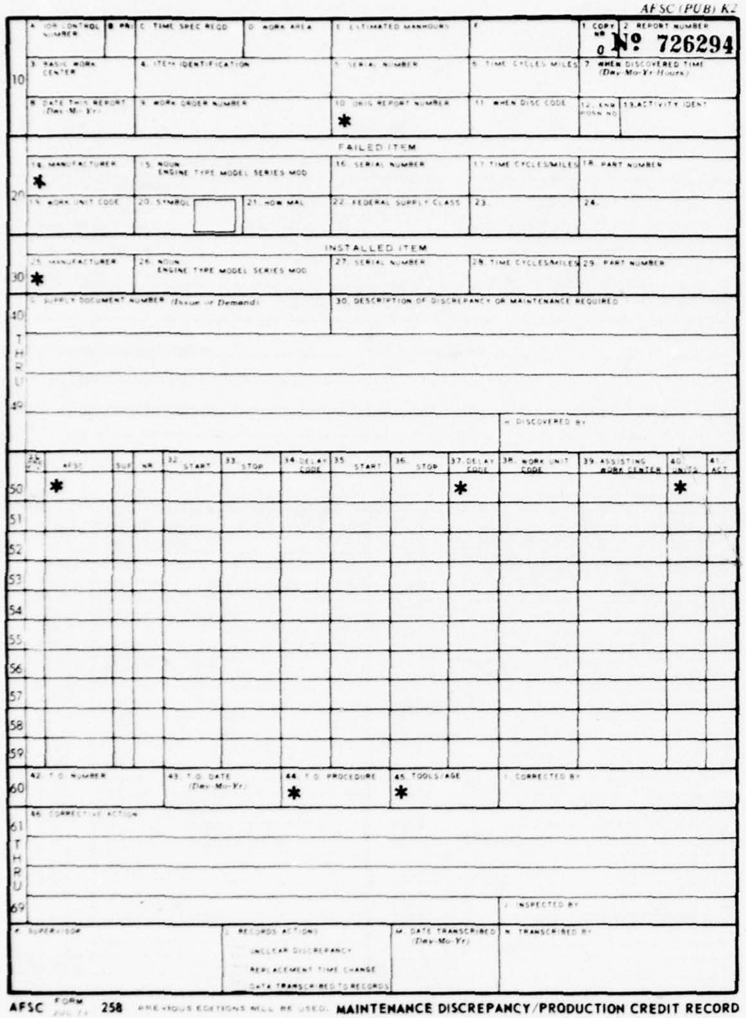
(c) AFSC Forms 258 and 258-4 – Maintenance Discrepancy/ Production Credit Record. (Figure 4-3c)

1. AFSC forms 258 and 258-4 are used to document specific types of maintenance actions, and their layout and information content are identical. These forms were developed for the collection of effectiveness data during operational tests. The information content is similar to, but more comprehensive than, that found on the AFTO form 349. The most significant difference is the expanded narrative portion, which can be stored in the computer; and the "Delay Code", "GSE", and "T.O. Evaluation" blocks. (The asterisks shown in figure 4-3c indicate information not found on form 349.) However, supplemental information must be collected pertaining to the equipment mission to complete the data element requirements for logistics assessment.

2. These forms were developed to provide inputs into the System Effectiveness Data System (SEDS). SEDS has been revised and improved and is now called the Machine Independent Systems Effectiveness Data System (MISEDS), for which the Air Force Flight Test Center, Edwards Air Force Base, CA, has responsibility. Instructions for completion of these forms are found in AFSC's Maintenance Technical Directive 69-1.

(d) AFFTC Form 300 – Aircraft Debriefing Record. (Figure 4-3d)

This form is totally aircraft-mission oriented and, when combined with AFSC form 258 or AFTO form 349, provides a significant amount of data applicable to assessments. The form was developed by the Air Force Flight Test Center, Edwards AFB, and appears to be applicable to a variety of aircraft test efforts. Instructions for the completion of this form are provided in appendix 4-3A.



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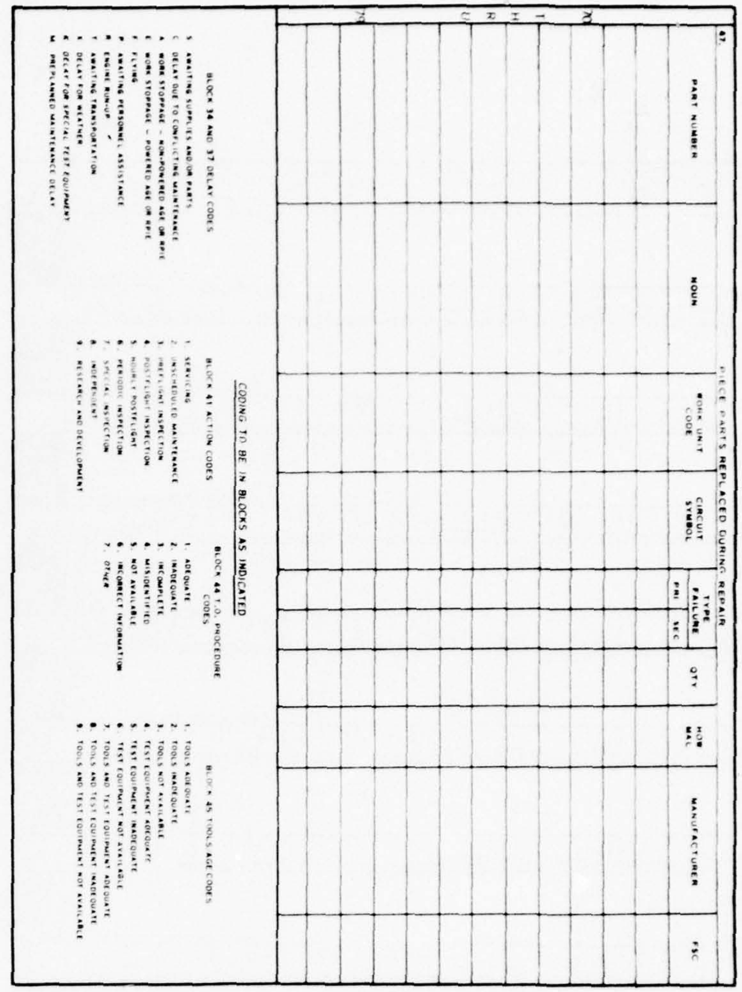

Back

*Denotes information not appearing on AFTO form 349 (see figure 4-3a).

Figure 4-3c. AFSC Form 258/258-4

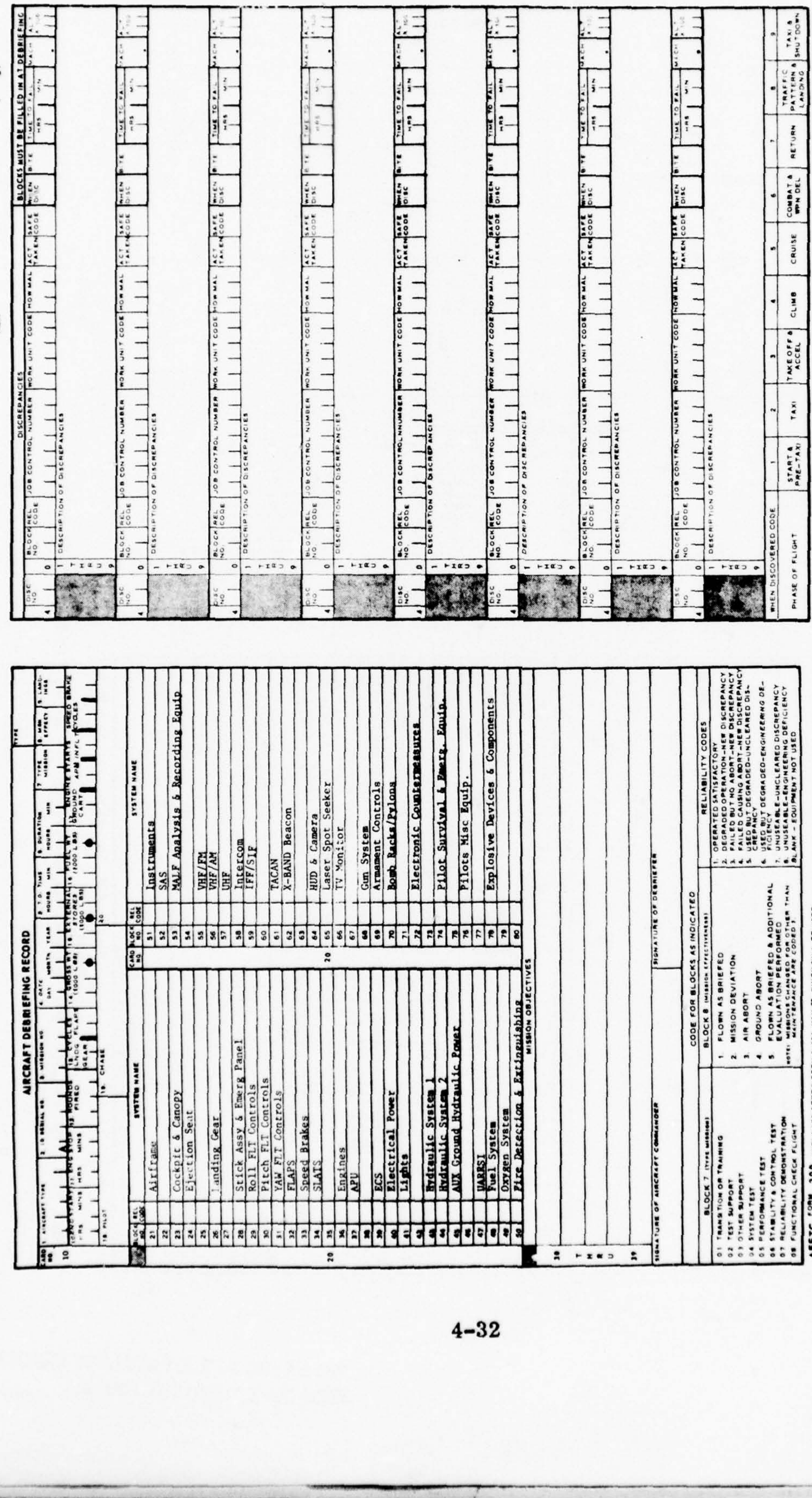

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Figure 4-3d. AFFTC Form 300

(·) AFTO 781 Series Forms.

This series of forms provides a maintenance, inspection, service, configuration, status, and flight record for the particular weapon or support system with which the forms have been designated for use. In a test environment, their application will depend on the type of information required for assessment purposes. They can be used in a variety of ways to supplement the collection of data. Instructions for the preparation of these forms are found in sections II and III of Technical Order 00-20-5. Forms in this series deemed applicable to operational test and evaluation are discussed in the following paragraphs.

1. AFTO Form 781 — Aerospace Vehicle Flight Data Document. (Figure 4-3e)

Recorded on this form are the names of the pilot and aircrew members, and pertinent information concerning each flight. The form is used in conjunction with AFTO form 781H.

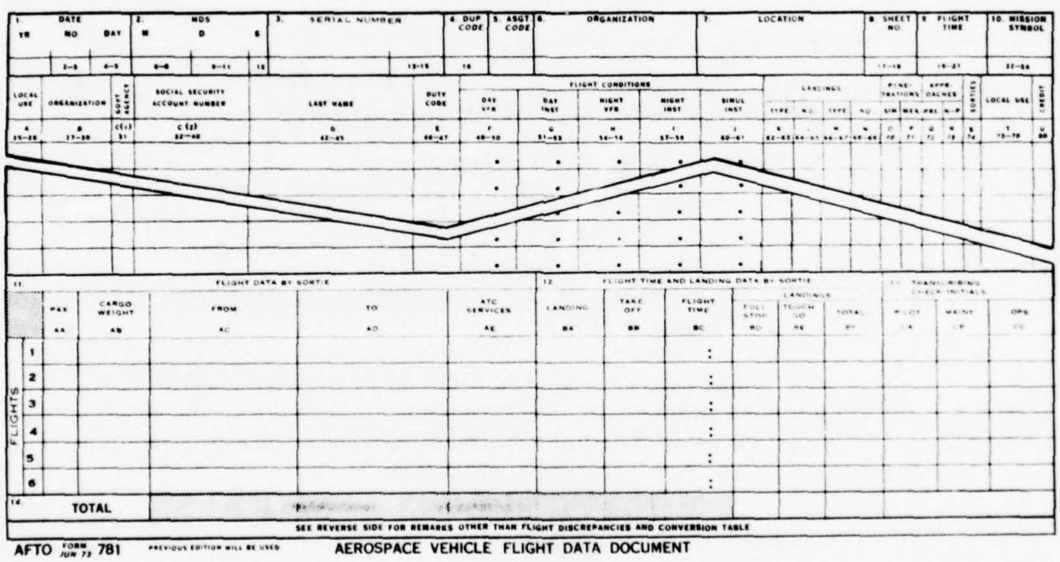

Figure 4-3e. AFTO Form 781

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2. <u>AFTO Form 781A — Maintenance Discrepancy and Work Document.</u> (Figure 4-3f)

This form is used to document each discrepancy discovered by the aircrew or maintenance personnel. The form provides a historical record of all discrepancies and the actions taken to correct the problem.

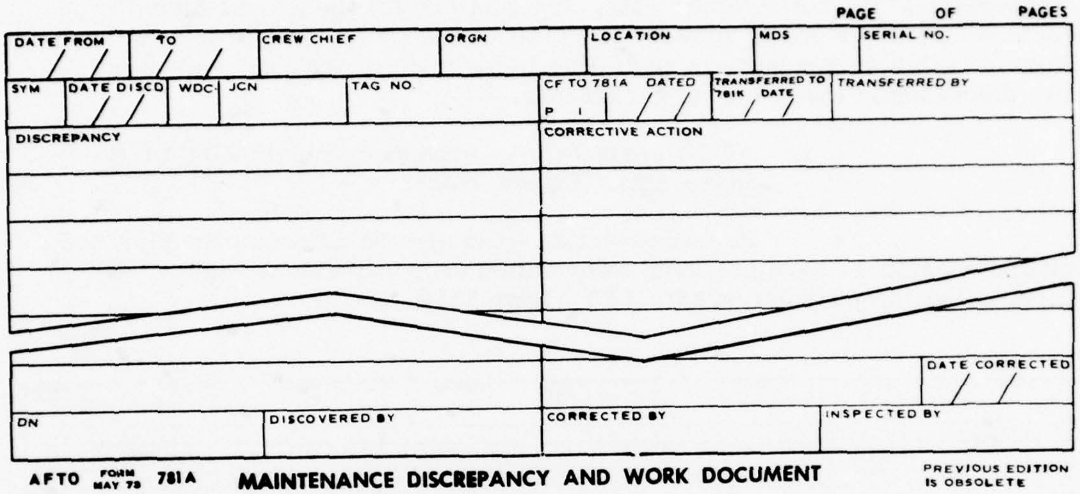


Figure 4-3f. AFTO Form 781A

3. <u>AFTO Form 781E — Accessory Replacement Document.</u> (Figure 4-3g)

The purpose of this form is to provide data that will facilitate compliance with inspection, replacement, and suspension requirements as specified in the applicable maintenance manuals. It also provides required information when reporting discrepancies.

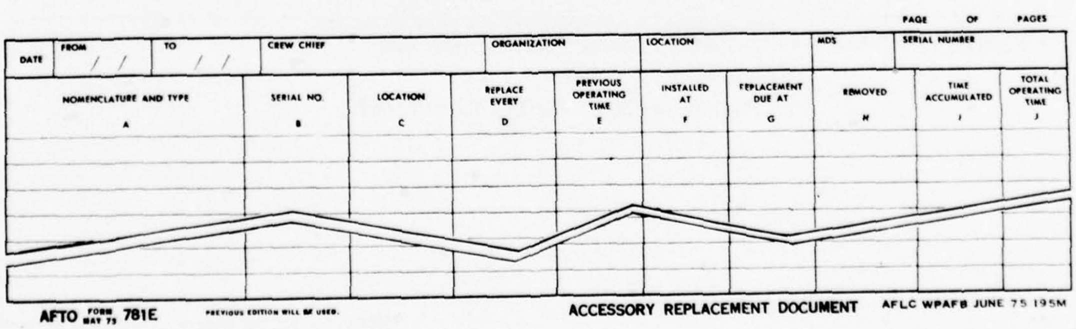
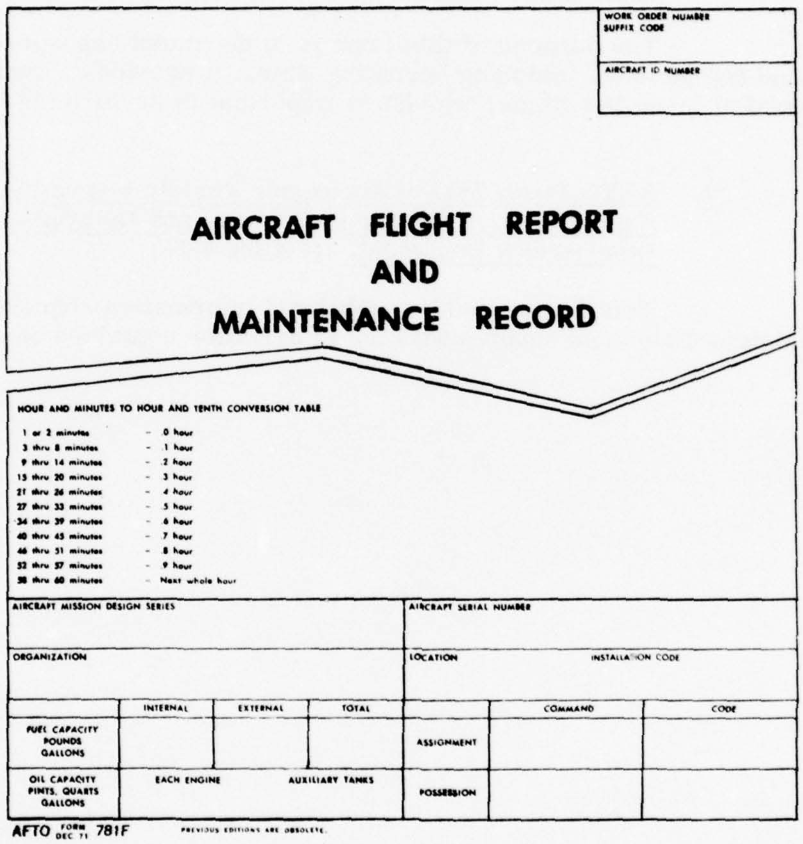


Figure 4-3g. AFTO Form 781E

4. <u>AFTO Form 781F – Aircraft Flight Report and Maintenance Record (New title is Aerospace Vehicle Flight Report and Maintenance Document).</u>
(Figure 4-3h)

This form identifies the system for which the particular series of 781 forms is applicable. It acts as a cover sheet for the other attached forms.



WORK ORDER NUMBER
SUFFIX CODE

AIRCRAFT ID NUMBER

AIRCRAFT FLIGHT REPORT
AND
MAINTENANCE RECORD

HOUR AND MINUTES TO HOUR AND TENTH CONVERSION TABLE

1 or 2 minutes	–	.0 hour
3 thru 8 minutes	–	.1 hour
9 thru 14 minutes	–	.2 hour
15 thru 20 minutes	–	.3 hour
21 thru 26 minutes	–	.4 hour
27 thru 33 minutes	–	.5 hour
34 thru 39 minutes	–	.6 hour
40 thru 45 minutes	–	.7 hour
46 thru 51 minutes	–	.8 hour
52 thru 57 minutes	–	.9 hour
58 thru 60 minutes	–	Next whole hour

AIRCRAFT MISSION DESIGN SERIES				AIRCRAFT SERIAL NUMBER		
ORGANIZATION				LOCATION	INSTALLATION CODE	
	INTERNAL	EXTERNAL	TOTAL		COMMAND	CODE
FUEL CAPACITY POUNDS GALLONS				ASSIGNMENT		
OIL CAPACITY PINTS, QUARTS GALLONS	EACH ENGINE	AUXILIARY TANKS		POSSESSION		

AFTO FORM DEC 71 781F   PREVIOUS EDITIONS ARE OBSOLETE.

Figure 4-3h. AFTO Form 781F

5. AFTO Form 781H – Aerospace Vehicle Flight Status and Maintenance Document. (Figure 4-3i)

This form documents maintenance status and servicing information that will provide operating personnel a ready reference as to the status of the aerospace vehicle. The form also indicates the status and history of inspections specifically related to daily operating activities.

6. AFTO Form 781J – Aerospace Vehicle-Engine Flight Document.(Figure 4-3j)

The purpose of this form is to document aerospace vehicle time and engine data, including operating time. It provides a running historical record of these two items, which are important in performing assessments.

7. AFTO Form 781K – Aerospace Vehicle Inspection, Engine Data, Calendar Inspection, and Delayed Discrepancy Document. (Figure 4-3k)

This form provides additional information concerning the aerospace vehicle's status and supplements the information contained on form 781J.

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1. DATE	2. CREW CHIEF	3. ORGANIZATION	4. LOCATION	5. MDS	6. SERIAL NUMBER

7. STATUS OF OVERDUE IN-PROGRESS AND ACCOMPLISHED INSPECTIONS INCLUDING FCFS

TYPE	SYM	SYSTEM	ACCOMPLISHED BY	COMPLETED DATE	COMPLETED TIME
				/ /	:
				/ /	:
				/ /	:
				/ /	:
				/ /	:
				/ /	:

8. CERTIFICATION FOR ACCOMPLISHMENT OF BASIC POSTFLIGHT OR THRUFLIGHT

PLT NO.	TYPE INSP.	ACCOMPLISHED BY	COMPLETED DATE	COMPLETED TIME
1.			/ /	:
2.			/ /	:
3.			/ /	:
4.			/ /	:
5.			/ /	:
6.			/ /	:

9. STATUS DATA

SEE BLOCK 7 AND AFTO FORMS 781A AND 781K FOR EXPLANATION OF THE STATUS SYMBOL

STATUS TODAY		BOX NO.	EXCEPTIONAL RELEASE (Enter Box No.)
1	7		
2	8		
3	9		
4	10		
5	11		
6	12		

10. FLIGHT CONDITION DATA

PLT NO.	COND. AFT PLT	PILOT'S SIGNATURE ENTER AFTER EACH FLIGHT	Over Temp Enctrd	Aux Engine or APU Operation
1				
2				
3				
4				
5				
6				

11. MUNITIONS/GUNS STATUS																				
STATUS	H	C	N	H	C	N	H	C	N	H	C	N	H	C	N	H	C	N	TOTAL TODAY
781A ENTRY	P	I		P	I		P	I		P	I		P	I		P	I		

12. SERVICING DATA

SER NO.	FUEL (Gallons or Pounds) OCTANE OR GRADE	QUANTITY SERVICED	TOTAL IN TANKS	OIL (Pints, Quarts, or Gallons) 1 SER	1 IN	2 SER	2 IN	3 SER	3 IN	4 SER	4 IN	5 SER	5 IN	6 SER	6 IN	7 SER	7 IN	8 SER	8 IN	OXY PRESS OR QTY	A.D.I. — WATER
1.																					
2.																					
3.																					
4.																					
5.																					
6.																					

13. SERVICING CERTIFICATION (Signature, Grade and Station at Which Servicing Is Accomplished)

1	BY	3	BY	5	BY
	AT		AT		AT
2	BY	4	BY	6	BY
	AT		AT		AT

14. AIRFRAME TIME		15. LANDINGS FULL STOP	TOTAL	16. CARTRIDGE STARTS NO.	ENG.	NO.	ENG.	17. ENGINE CYCLE DOCUMENTATION NO. 1 ENG.	NO. 2 ENG.	NO. 3 ENG.	NO. 4 ENG.	NO. 5 ENG.	NO. 6 ENG.	NO. 7 ENG.	NO. 8 ENG.
PREVIOUS															
FLIGHTS	1														
	2														
	3														
	4														
	5														
	6														
TOTAL															

AFTO FORM MAY 73 781H   PREVIOUS EDITION IS OBSOLETE.   AEROSPACE VEHICLE FLIGHT STATUS AND MAINTENANCE DOCUMENT

☆ U.S. Government Printing Office: 1973-756-524

Figure 4-31. AFTO Form 781H

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DATE	FROM	TO	CREW CHIEF	ORGANIZATION	LOCATION	MDS	SERIAL NUMBER
	/ /	/ /					

AIRFRAME AND ENGINE OPERATING TIME AND CYCLE DOCUMENTATION

DATE	AIRFRAME TIME	OIL CHANGE	OVER TEMP	OIL CHANGE	OVER TEMP	OIL CHANGE	OVER TEMP	OIL CHANGE	OVER TEMP	OIL CHANGE	OVER TEMP	OIL CHANGE	OVER TEMP	OIL CHANGE	OVER TEMP	OIL CHANGE	OVER TEMP
		NO. 1 ENG		NO. 2 ENG		NO. 3 ENG		NO. 4 ENG		NO. 5 ENG		NO. 6 ENG		NO. 7 ENG		NO. 8 ENG	
		TIME	CYCLES	TIME	CYCLES	TIME	CYCLES	TIME	CYCLES	TIME	CYCLES	TIME	CYCLES	TIME	CYCLES	TIME	CYCLES
PREVIOUS																	
/ /																	
TOTAL																	
/ /																	
TOTAL																	
/ /																	
TOTAL																	
/ /																	
TOTAL																	
/ /																	
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TOTAL																	
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TOTAL																	
/ /																	
TOTAL																	
/ /																	
TOTAL																	
/ /																	
TOTAL																	
/ /																	
CARRIED FORWARD																	

AFTO FORM MAY 73 781J PREVIOUS EDITION IS OBSOLETE. AEROSPACE VEHICLE-ENGINE FLIGHT DOCUMENT ☆ U.S. GOVERNMENT PRINTING OFFICE 1973— 758-919/7006

Figure 4-3j. AFTO Form 781J

DATE FROM	TO	CREW CHIEF	ORGANIZATION	LOCATION	MDS	SERIAL NUMBER
/ /	/ /					

A. AIRCRAFT INSPECTION STATUS					
NEXT PERIODIC, MAJOR, OR PHASED INSPECTION DUE NO					
TYPE	FREQ	COMPL	NEXT DUE	COMPL	NEXT DUE

B. ENGINE DATA			TYPE		
PSN	ENG SER NO	ENG CHANGE DUE TIME	PSN	ENG SER NO	ENG CHANGE DUE TIME
1			5		
2			6		
3			7		
4			8		

C. CALENDAR INSP STATUS		DATE OF LAST FLIGHT	/ /
TYPE	DATE DUE	TYPE	DATE DUE
	/ /		/ /

D. STATUS OF DEPOT LEVEL INSPECTION	
LAST DEPOT LEVEL FACILITY	
DATE COMPLETED	ACFT TIME
/ /	

E. IMMEDIATE AND URGENT ACTION TCTOs COMPLETED WITHIN THE PAST 10 DAYS			
TO NUMBER AND PUBLICATION DATE	DATE CW	TO NUMBER AND PUBLICATION DATE	DATE CW
	/ /		/ /
	/ /		/ /
	/ /		/ /

F. HIGHER AUTHORITY INSPECTIONS			
DATE	SIGNATURE AND TITLE	DATE	SIGNATURE AND TITLE
/ /		/ /	
/ /		/ /	
/ /		/ /	

G. CALENDAR AND HOURLY INSPECTION SCHEDULE							
INSPECTION ITEM	FREQUENCY	NEXT DUE	NEXT DUE	NEXT DUE	NEXT DUE	NEXT DUE	NEXT DUE

AFTO FORM MAY 73 781K PREVIOUS EDITIONS ARE OBSOLETE AEROSPACE VEHICLE INSPECTION, ENGINE DATA, CALENDAR INSPECTION AND DELAYED DISCREPANCY DOCUMENT

Front

H. URGENT ACTION AND OUTSTANDING ROUTINE ACTION TCTOs AND DELAYED DISCREPANCIES							
			WHEN DISC'D OR ENTERED				
SYM	TCTO NUMBER AND PUBLICATION DATE OR DISCREPANCY	SYS	DATE	ACFT TIME	CODE	DATE TO AFTO 349 OR 781A OR DATE CW	TRANSFERRED BY OR COMP VERIFIED BY (Signature)
			/ /			/ /	
			/ /			/ /	
			/ /			/ /	
			/ /			/ /	
			/ /			/ /	
			/ /			/ /	
			/ /			/ /	
			/ /			/ /	
			/ /			/ /	

*U.S.Government Printing Office: 1973 — 756-514/131 Region 5-11

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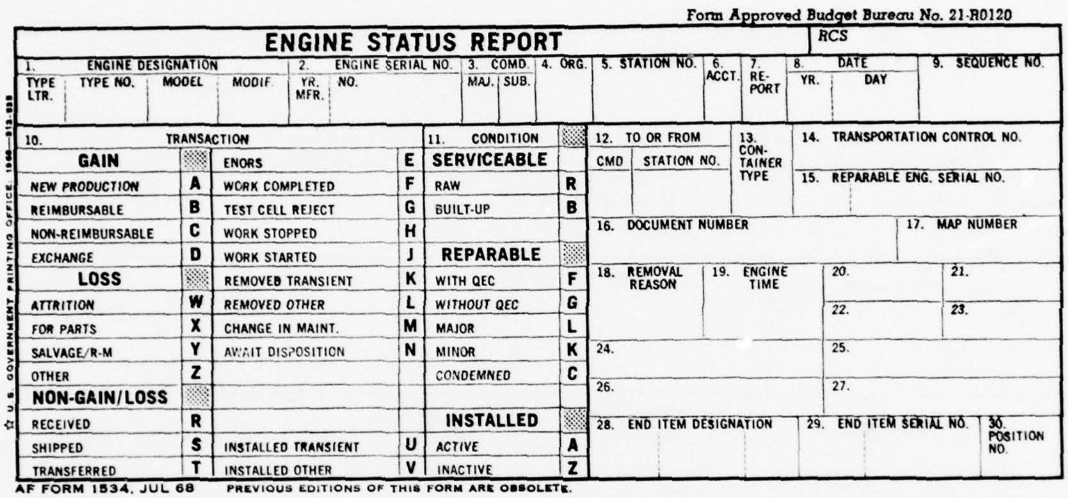
Figure 4-3k. AFTO Form 781K

(f) AF Form 1534 – Engine Status Report. (Figure 4-31)

This form provides for detailed information concerning the condition of each aerospace vehicle engine in the inventory. From a test and evaluation point of view, the form can provide significant historical information, as well as certain data elements for assessment. Instructions for preparing this form appear in AFM 400-1, Volume II, Selective Management of Propulsion Units.


Form Approved Budget Bureau No. 21-R0120

ENGINE STATUS REPORT

RCS

1. ENGINE DESIGNATION: TYPE LTR. | TYPE NO. | MODEL | MODIF.
2. ENGINE SERIAL NO.: YR. MFR. | NO.
3. COMD.: MAJ. | SUB.
4. ORG.
5. STATION NO.
6. ACCT.
7. REPORT
8. DATE: YR. | DAY
9. SEQUENCE NO.

10. TRANSACTION				11. CONDITION	
GAIN		ENORS	E	SERVICEABLE	
NEW PRODUCTION	A	WORK COMPLETED	F	RAW	R
REIMBURSABLE	B	TEST CELL REJECT	G	BUILT-UP	B
NON-REIMBURSABLE	C	WORK STOPPED	H		
EXCHANGE	D	WORK STARTED	J	REPARABLE	
LOSS		REMOVED TRANSIENT	K	WITH QEC	F
ATTRITION	W	REMOVED OTHER	L	WITHOUT QEC	G
FOR PARTS	X	CHANGE IN MAINT.	M	MAJOR	L
SALVAGE/R-M	Y	AWAIT DISPOSITION	N	MINOR	K
OTHER	Z			CONDEMNED	C
NON-GAIN/LOSS					
RECEIVED	R			INSTALLED	
SHIPPED	S	INSTALLED TRANSIENT	U	ACTIVE	A
TRANSFERRED	T	INSTALLED OTHER	V	INACTIVE	Z

12. TO OR FROM: CMD | STATION NO.
13. CONTAINER TYPE
14. TRANSPORTATION CONTROL NO.
15. REPARABLE ENG. SERIAL NO.
16. DOCUMENT NUMBER
17. MAP NUMBER
18. REMOVAL REASON
19. ENGINE TIME
20.
21.
22.
23.
24.
25.
26.
27.
28. END ITEM DESIGNATION
29. END ITEM SERIAL NO.
30. POSITION NO.

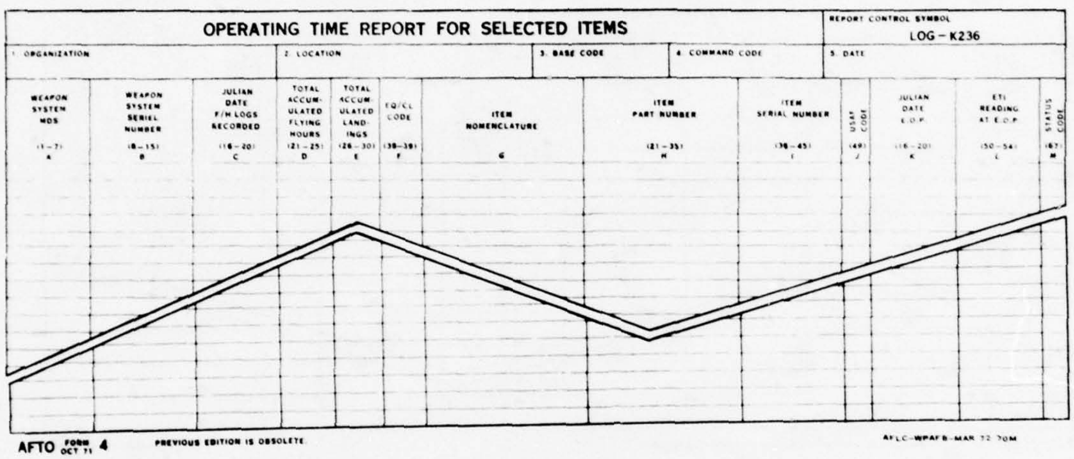
U.S. GOVERNMENT PRINTING OFFICE: 1968—313-938

AF FORM 1534, JUL 68 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

Figure 4-31. AF Form 1534

(g) AFTO Form 4 – Operating Time Report for Selected Items. (Figure 4-3m)

This form records elapsed time indicator (ETI) readings for selected items installed on aircraft or missiles, or on designated aircraft. The information provided by the form is useful for assessment efforts. Instructions for completing this form appear in TO 00-20-10-2.



OPERATING TIME REPORT FOR SELECTED ITEMS — REPORT CONTROL SYMBOL LOG – K236

1. ORGANIZATION	2. LOCATION	3. BASE CODE	4. COMMAND CODE	5. DATE

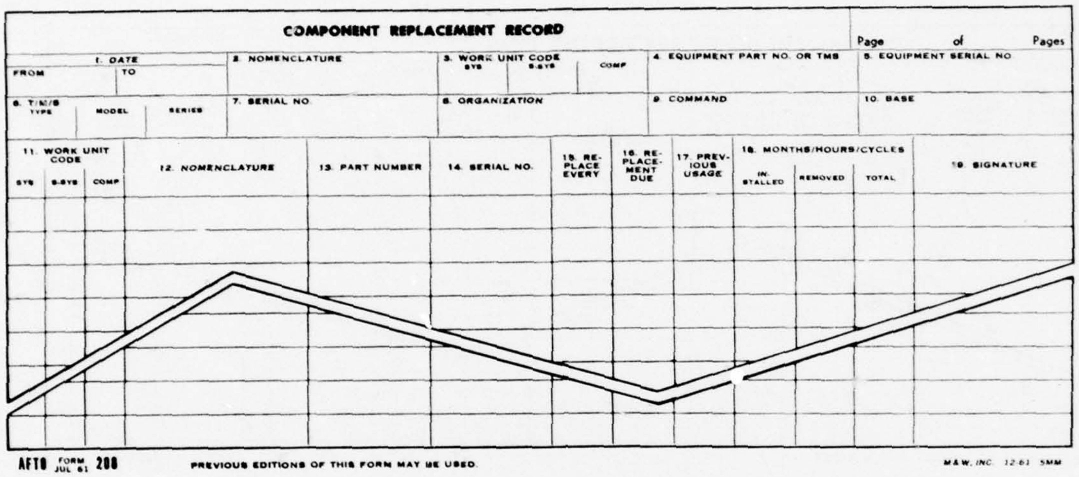
WEAPON SYSTEM MDS (1–7) A	WEAPON SYSTEM SERIEL NUMBER (8–15) B	JULIAN DATE F/H LOGS RECORDED (16–20) C	TOTAL ACCUMULATED FLYING HOURS (21–25) D	TOTAL ACCUMULATED LANDINGS (26–30) E	EQ/CL CODE (38–39) F	ITEM NOMENCLATURE G	ITEM PART NUMBER (21–35) H	ITEM SERIAL NUMBER (36–45) I	USAF CODE (49) J	JULIAN DATE E.O.P. (16–20) K	ETI READING AT E.O.P. (50–54) L	STATUS CODE (67) M

AFTO FORM OCT 71 4 PREVIOUS EDITION IS OBSOLETE. AFLC–WPAFB–MAR 72 70M

Figure 4-3m. AFTO Form 4

(h) AFTO Form 208 – Component Replacement Record. (Figure 4-3n)

This form provides a means of maintaining a current record of items requiring replacement at specified calendar times, operating hours, or cycles. It also provides a historical summary of when these replacements occurred. Instructions for this form are found in TOs 00-20-6 and 00-20-7.



COMPONENT REPLACEMENT RECORD

Page of Pages

1. DATE FROM TO | 2. NOMENCLATURE | 3. WORK UNIT CODE SYS S-SYS COMP | 4. EQUIPMENT PART NO. OR TMS | 5. EQUIPMENT SERIAL NO

6. T/M/S TYPE MODEL SERIES | 7. SERIAL NO. | 8. ORGANIZATION | 9. COMMAND | 10. BASE

11. WORK UNIT CODE			12. NOMENCLATURE	13. PART NUMBER	14. SERIAL NO.	15. REPLACE EVERY	16. REPLACEMENT DUE	17. PREVIOUS USAGE	18. MONTHS/HOURS/CYCLES			19. SIGNATURE
SYS	S-SYS	COMP							INSTALLED	REMOVED	TOTAL	

AFTO FORM JUL 61 208 PREVIOUS EDITIONS OF THIS FORM MAY BE USED. M&W, INC. 12-61 5MM

Figure 4-3n. AFTO Form 208

(i) AFTO Form 443 – Trainer/AGE Status and Operating Record. (Figure 4-3o)

This form provides a means for recording scheduled inspections, power-on operating time, and condition status for training equipment and powered aerospace ground equipment. TO 00-20-6, Section IX, and TO 00-20-7, Section III, present instructions for preparing this form.

(j) AFTO Form 444 – Trainer/AGE Maintenance Record. (Figure 4-3p)

This form is an equipment maintenance document used in conjunction with AFTO form 443 to record selected maintenance requirements and their accomplishment. TO 00-20-6, Section X, and TO 00-20-7, Section IV, contain instructions for completing this form.

PART I — ITEM IDENTIFICATION RECORD

1. DATE FROM / TO	2. NOMENCLATURE	3. TYPE/MODEL	4. REGISTRATION/SERIAL NO	5. WORK UNIT CODE	6. I.D./SERIAL NO	7. ORGANIZATION
/ / — / /						

PART II — INSPECTION RECORD

TYPE AND NUMBER	INTERVAL	DATE/HOUR DUE	DATE/HOUR COMPLETED	TYPE AND NUMBER	INTERVAL	DATE/HOUR DUE	DATE/HOUR COMPLETED	TYPE AND NUMBER	INTERVAL	DATE/HOUR DUE	DATE/HOUR COMPLETED	TYPE AND NUMBER	INTERVAL	DATE/HOUR DUE	DATE/HOUR COMPLETED

PART III — DAILY/SERVICE INSPECTION, STATUS AND OPERATING RECORD

TIME DATE	INITIALS OF INSP	STATUS TODAY	HOURS/STARTS TODAY	HOURS/STARTS TOTAL	TIME DATE	INITIALS OF INSP	STATUS TODAY	HOURS/STARTS TODAY	HOURS/STARTS TOTAL	TIME DATE	INITIALS OF INSP	STATUS TODAY	HOURS/STARTS TODAY	HOURS/STARTS TOTAL

AFTO FORM JUN 73 443 REPLACES AFTO FORMS ... WHICH ARE OBSOLETE. TRAINER/AGE STATUS AND OPERATING RECORD

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PART III — DAILY/SERVICE INSPECTION, STATUS AND OPERATING RECORD (Cont'd)

TIME DATE	INITIALS OF INSP	STATUS TODAY	HOURS/STARTS TODAY	HOURS/STARTS TOTAL	TIME DATE	INITIALS OF INSP	STATUS TODAY	HOURS/STARTS TODAY	HOURS/STARTS TOTAL	TIME DATE	INITIALS OF INSP	STATUS TODAY	HOURS/STARTS TODAY	HOURS/STARTS TOTAL

PART IV — SUPERVISORY REVIEW	SIGNATURE AND GRADE	DATE	SIGNATURE AND GRADE	DATE	SIGNATURE AND GRADE	DATE
		/ /		/ /		/ /
	SIGNATURE AND GRADE	DATE / /	SIGNATURE AND GRADE	DATE / /	SIGNATURE AND GRADE	DATE / /

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Figure 4-3o. AFTO Form 443

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PART I — ITEM IDENTIFICATION RECORD						
1. DATE FROM / / TO / /	2. NOMENCLATURE	3. TYPE/MODEL	4. REGISTRATION/SERIAL NO	5. WORK UNIT CODE	6. I.D./SERIAL NO	7. ORGANIZATION

PART II — MAINTENANCE RECORD								
DATE DISCOVERED	DISC BY	SYM	WHEN DISC CODE	DISCREPANCY	JOB CONTROL NUMBER	CORRECTIVE ACTION	DATE CORRECTED	CORRECTED BY / INSPECTED BY
/ /							/ /	

AFTO FORM JUN 72 444 REPLACES PART IV, AFTO FORMS 45 AND 65, WHICH ARE OBSOLETE. TRAINER/AGE MAINTENANCE RECORD

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PART II — MAINTENANCE RECORD (Cont'd)								
DATE DISCOVERED	DISC BY	SYM	WHEN DISC CODE	DISCREPANCY	JOB CONTROL NUMBER	CORRECTIVE ACTION	DATE CORRECTED	CORRECTED BY / INSPECTED BY
/ /							/ /	

PART III — SUPERVISORY REVIEW						
SIGNATURE AND GRADE	DATE / /	SIGNATURE AND GRADE	DATE / /	SIGNATURE AND GRADE	DATE / /	
SIGNATURE AND GRADE	DATE / /	SIGNATURE AND GRADE	DATE / /	SIGNATURE AND GRADE	DATE / /	

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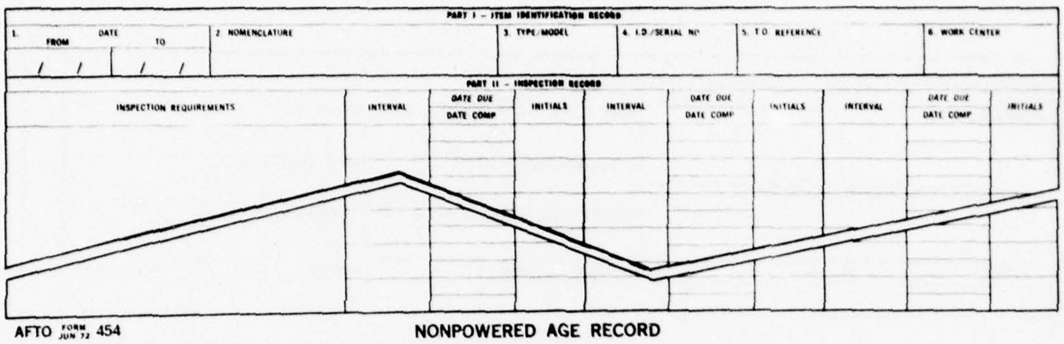
Figure 4-3p. AFTO Form 444

(k) AFTO Form 454 – Nonpowered AGE Record. (Figure 4-3q)

This form is used to document inspection requirements and accomplishments, modifications, repair actions, and delayed discrepancies on nonpowered AGE or trainers. TO 00-20-6, Section XI, and TO 00-20-7, Section V, provide instructions for filling in this form.


PART I – ITEM IDENTIFICATION RECORD
1. DATE FROM TO
2. NOMENCLATURE
3. TYPE/MODEL
4. I.D./SERIAL NO
5. T.O. REFERENCE
6. WORK CENTER
PART II – INSPECTION RECORD
INSPECTION REQUIREMENTS
INTERVAL
DATE DUE / DATE COMP
INITIALS
INTERVAL
DATE DUE / DATE COMP
INITIALS
INTERVAL
DATE DUE / DATE COMP
INITIALS
AFTO FORM JUN 72 454
NONPOWERED AGE RECORD

Front

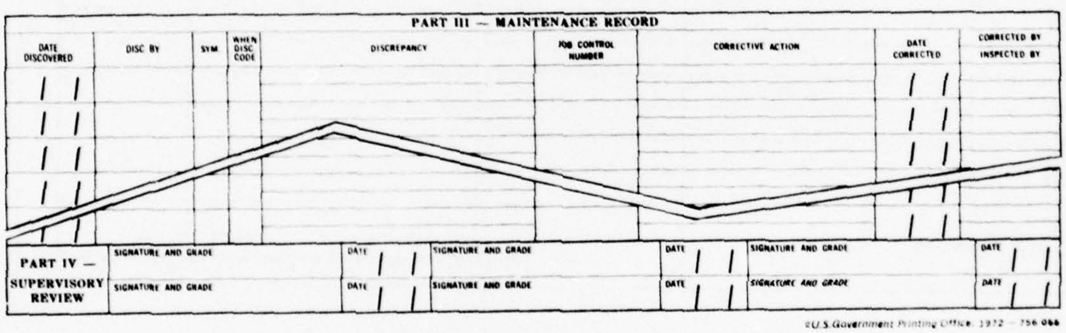

PART III — MAINTENANCE RECORD
DATE DISCOVERED
DISC BY
SYM
WHEN DISC CODE
DISCREPANCY
JOB CONTROL NUMBER
CORRECTIVE ACTION
DATE CORRECTED
CORRECTED BY / INSPECTED BY
PART IV — SUPERVISORY REVIEW
SIGNATURE AND GRADE
DATE
SIGNATURE AND GRADE
DATE
SIGNATURE AND GRADE
DATE
*U.S. Government Printing Office: 1972 — 756-066

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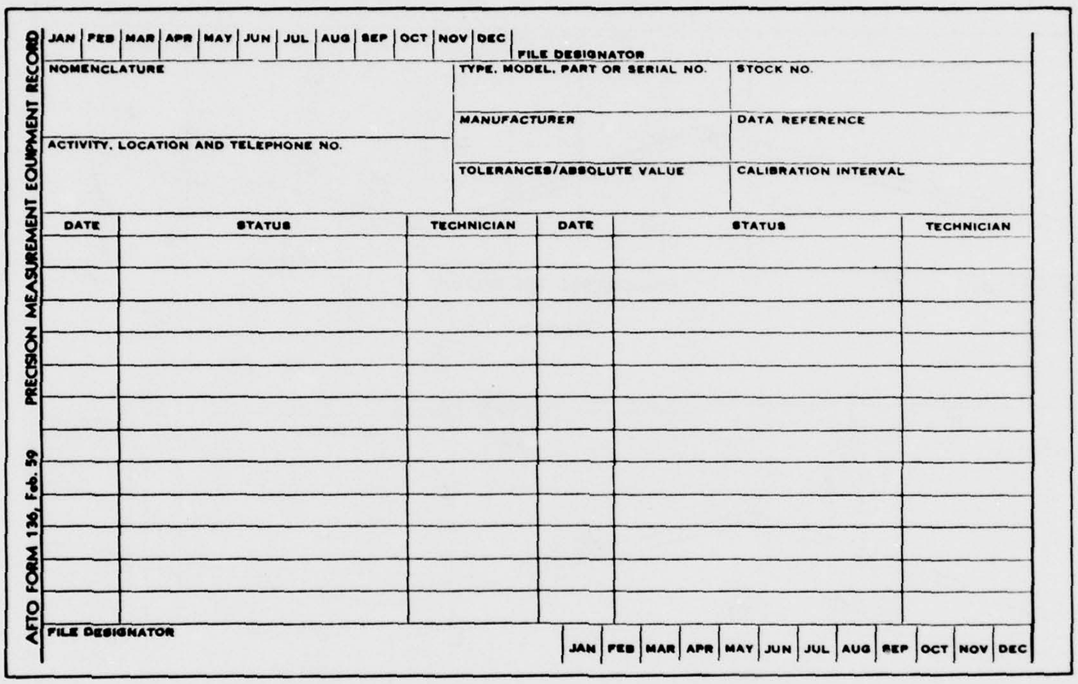
Figure 4-3q. AFTO Form 454

(l) <u>AFTO Form 136 – Precision Measurement Equipment (PME) Record</u>. (Figure 4-3r)

This form is associated with PME to document the type of equipment and information associated with calibration of the equipment. It also provides a historical record pertaining to each inspection and calibration interval. Information pertaining to the use and instructions for completion of this form are contained in TO 00-20-14.


PRECISION MEASUREMENT EQUIPMENT RECORD

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

FILE DESIGNATOR

NOMENCLATURE	TYPE, MODEL, PART OR SERIAL NO.	STOCK NO.
	MANUFACTURER	DATA REFERENCE
ACTIVITY, LOCATION AND TELEPHONE NO.	TOLERANCES/ABSOLUTE VALUE	CALIBRATION INTERVAL

DATE	STATUS	TECHNICIAN	DATE	STATUS	TECHNICIAN

FILE DESIGNATOR

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

AFTO FORM 136, Feb. 59

Figure 4-3r. AFTO Form 136

(m) <u>AFTO Form 210E – On-Equipment Support, General Work and Minor Fix Maintenance.</u> (Figure 4-3s)

AFTO form 210E provides for documentation of the accomplishment of scheduled inspections for ground communications, electronics, meteorological (CEM) equipment. This form is a partially prepunched card that requires some manual entries, and is used with mechanized inspection scheduling system. Instructions and usage of the form are delineated in TO 00-20-10-3.

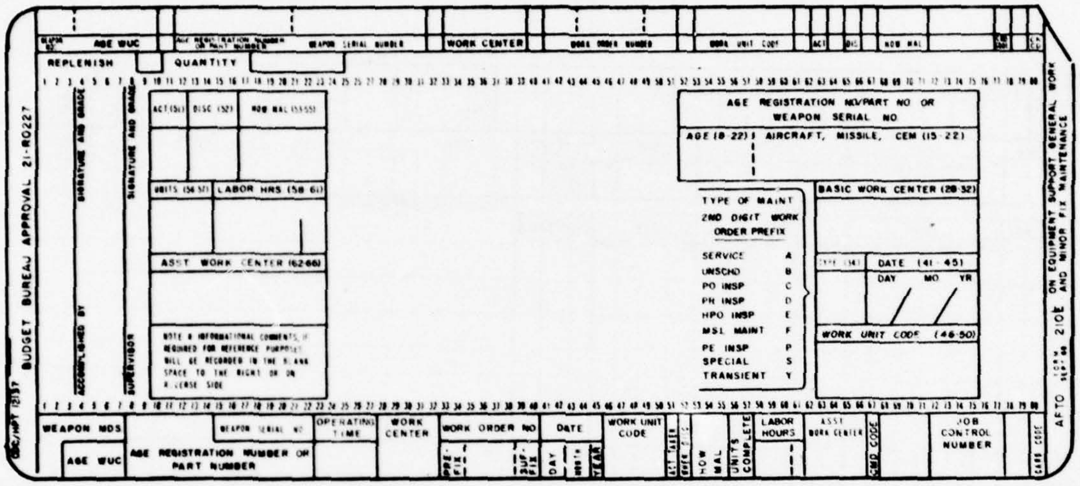


Figure 4-3s. AFTO Form 210E

(n) <u>AF Form 2445 – Job Control Document.</u> (Figure 4-3t)

One unique application of the AF form 2445 is to provide inventory and status information on ground CEM equipment. Instructions for this form, when used for the above purpose, are contained in AFM 65-265 (to be replaced by AFM 65-662) and AFM-66-1, Volumes 10 and 11. From a test and evaluation point of view, this form can be used to report selected maintenance information on all hardware types listed in table 4-3a. Its use is not restricted to CEM equipment.

ESR	ID	COMD CODE	COMD OPTION	JCN	ORGN	UNIT	TYPE	MODEL	SERIES	COMD OPTION	DTC
YES											

NO	MO	STOP	START	DUR	DC	MDC	SPC	WUC	SER NO	COMD OPTION	ECC	MCC
		DAY HR MIN	DAY HR MIN	HRS TENS								

DELAYS	MO	STOP	START	DUR	DC	MDC	SPC	DISCREPANCY/CORRECTION
		DAY HR MIN	DAY HR MIN	HRS TENS				
1								
2								
3								
4								
5								
6								
7								

REPORTED BY/TIME	ASSIGNED TO/TIME	CLOSED/TIME

	1	2	3	4	5	6	7 JC INITIALS
OPEN							
CLOSED							JC INITIALS

EQUIPMENT/LOCATION	PRI	ETRO	RECOVERY
	SER NO		JCN

AF FORM JUN 72 2445 JOB CONTROL DOCUMENT

Figure 4-3t. AF Form 2445

(o) Supplemental Forms.

The Air Force has developed a multitude of forms for recording a wide variety of information. A selection of forms to supplement those presented in table 4-3a is provided by table 4-3b. Through a form selection process, from these two tables the majority of test information can be documented for assessment purposes. Examples of the forms listed in table 4-3b are contained in appendix 4-3B.

(p) Other Forms.

Two additional forms worthy of discussion are AF forms 359 and 359a (figure 4-3u), both associated with the Maintenance Management Information Control System (MMICS). When the second increment of MMICS is implemented Air Force-wide, these two forms will become obsolete. Until that time they will be available and can be used for data collection purposes. Use of these forms or derivatives may continue if prescribed by test plans. Instructions for the use and preparation of these forms are contained in the following Air Force Manuals:

1. AFM 65-260, Aerospace Vehicle Inventory, Status and Utilization Reporting.

2. AFM 65-272, Trainer Equipment Inventory, Utilization and Status Reporting System.

3. AFR 65-110, Standard Aerospace Vehicle and Equipment Inventory, Status and Utilization Reporting.

(q) Special Forms.

Certain test programs may require the use of special forms. Such forms can be designed by applying the following general procedure:

1. The specific data elements to be collected are identified, along with their measurement units (hours, cycles, etc.).

2. Data element definitions are developed if they do not exist.

3. Supplementary information such as end item identification, date, test program, location, etc., are determined.

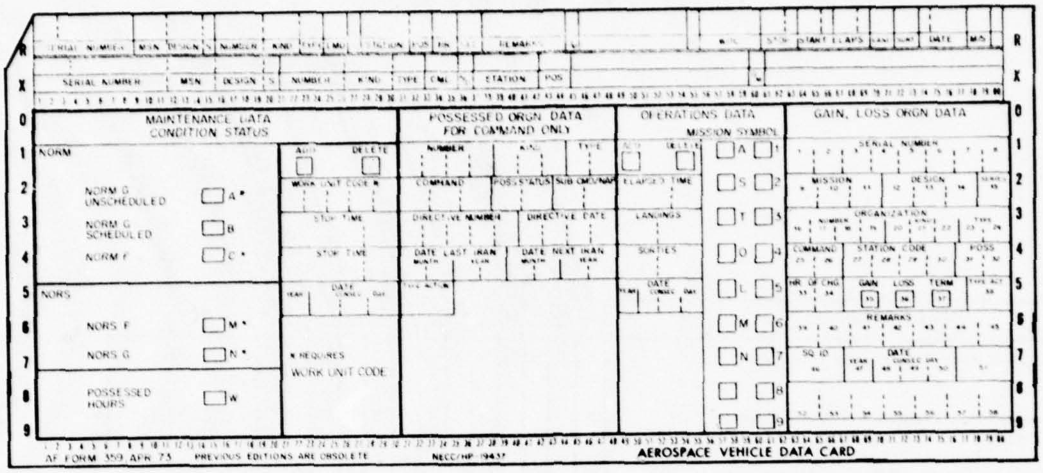
4. A format for the form is developed. The layout should include space for notes, comments, names of team members, and other general information pertinent to the test program. Form layout may require several iterations before an adequate format is obtained. Simplicity should always be the key element in designing a form.

TABLE 4-3b. MATRIX OF SUPPLEMENTAL FORMS AND THEIR HARDWARE APPLICABILITY (Sheet 1 of 2)

Primary Air Force Form	Hardware Applicability: Aircraft	Missiles, Air Launched	Missiles, Ground Launched	ICBM	AGE/SE	Ground CEM	Trainers/Simulators	Drones	Engines	PME	Munitions (Non-Nuclear)	Technical Orders	Personnel Evaluation	Associated Documents
AFTO Form 44, Turbine Wheel Historical Record									X					T.O. 00-20-5 T.O. 00-20-6
AFTO Form 95, Significant Historical Record	X	X	X	X	X	X	X	X	X					T.O. 00-20-4, -20-6, -20-7, -20-8
AFTO Form 100, Aircraft Data Record	X							X						T.O. 00-20-5
AFTO Form 100A, Accessory Replacement Record	X							X						T.O. 00-20-5
AFTO Form 102, Munition Inspection Document											X			T.O. 11A-1-10
AFTO Form 103, Aircraft/Missile Condition Report	X	X	X	X										T.O. 00-25-4
AFTO Form 105, Inspection Maintenance Firing Data for Ground Weapons											X			T.O. 11W-1-10
AFTO Form 119, Oil Analysis Request	X							X	X					T.O. 42B2-1-9
AFTO Form 119A, Oil Analysis Record	X							X	X					T.O. 42B2-1-9
AFTO Form 120, Electron Tube Field Life Record	X		X	X	X	X	X	X		X				T.O. 00-20-8
AFTO Form 120A, Electron Tube Performance and Status Report	X		X	X	X	X	X	X		X				T.O. 00-20-8
AFTO Form 158, Technical Order Review Comment Sheet											X			T.O. 00-5-1
AFTO Form 207, Status and Operational Record			X											T.O. 00-20-6
AFTO Form 209, Maintenance Log			X	X	X									T.O. 00-20-6
AFTO Form 223, Time Change Requirements Forecast	X	X	X					X	X		X			T.O. 00-20-9
AFTO Form 781D, Calendar and Hourly Item Inspection Document	X	X						X						T.O. 00-20-5
AF Form 991, Record of Cannibalization	X	X	X	X	X	X	X	X	X					T.O. 00-20-2 T.O. 00-20-4
AF Form 2400, Job Standard													X	AFM 66-1, Vol. 2
AF Form 2401, Equipment Utilization and Maintenance Schedule	X	X	X	X	X	X	X	X		X	X			AFM 66-1, Vols. 2 and 9
AF Form 2403, Weekly Aircraft Utilization/ Maintenance Schedule	X													AFM 66-1, Vol. 2

TABLE 4-3b. (Sheet 2 of 2)

Primary Air Force Form	Hardware Applicability: Aircraft	Missiles, Air Launched	Missiles, Ground Launched	ICBM	AGE/SE	Ground CEM	Trainers/Simulators	Drones	Engines	PME	Munitions (Non-Nuclear)	Technical Orders	Personnel Evaluation	Associated Documents
AF Form 2406, Maintenance Preplan	X	X	X	X	X	X	X	X		X	X			AFM 66-1, Vol. 2
AF Form 2410, Inspection/TCTO Planning Checksheet	X								X					AFM 66-1, Vol. 2
AF Form 2412, Flight Status Register	X													AFM 66-1, Vols. 2 and 12
AF Form 2416, Personnel/Crew Evaluation Report													X	AFM 66-1, Vols. 2 and 6
AF Form 2417, Technical Inspection Points Computation													X	AFM 66-1, Vols. 2 and 11
AF Form 2418, Personnel Evaluation and Points Computation													X	AFM 66-1, Vol. 2
AF Form 2420, Quality Control Inspection Summary	X	X	X	X	X	X	X	X	X	X	X			AFM 66-1, Vols. 2 and 9
AF Form 2422, Maintenance Analysis Referral	X	X	X	X	X	X	X	X	X	X	X			AFM 66-1, Vols. 2 and 9
AF Form 2423, Technical Order Improvement or Unsatisfactory Materiel Reports Log	X	X	X	X	X	X	X	X	X	X	X	X		AFM 66-1, Vols. 2 and 10
AF Form 360, NORS Detail Data	X	X	X	X	X	X	X	X	X	X				AFM 67-1
AF Form 2424, Maintenance Training Document													X	AFM 66-1, Vols. 2 and 3
AF Form 2431, Aerospace Ground Equipment Status					X									AFM 66-1, Vol. 4
AF Form 2435, Load Training and Certification Document													X	AFM 66-1, Vol. 6
AF Form 2436, Weekly/Daily Aircraft Utilization Schedule	X													AFM 66-1, Vol. 2
AF Form 2443, Shop Workload Summary	X	X	X	X	X	X	X	X	X	X	X			AFM 66-1, Vols. 2, 9 and 12
AF Form 2448, Personnel Evaluation Report													X	AFM 66-1, Vol. 10



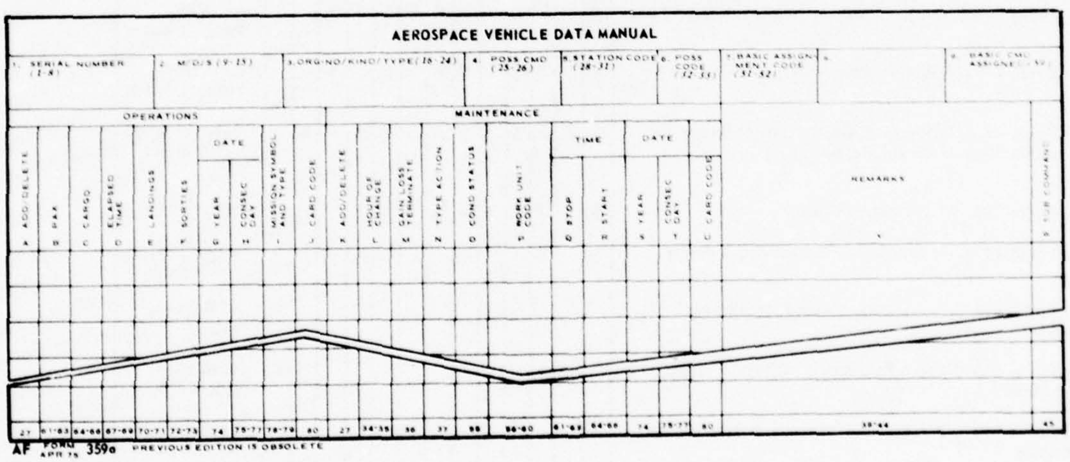


Figure 4-3u. **AF Forms 359 and 359a**

5. A set of instructions for the form is prepared. If only a few instructions are required, they may be printed on the back of the form. Longer and more detailed instructions may require the development of a multi-page document. These instructions should describe the utility of the form and its intended applications, as well as present details concerning the completion of the form.

(2) Data Element Summary.

(a) Based on the forms presented in figures 4-3a through 4-3t, a matrix was developed that readily identifies the data elements that can be obtained from each listed form. Conversely, the matrix provides for easy identification of the form to use when the required data elements have been established. This matrix appears as table 4-3c.

(b) As table 4-3c demonstrates, at least two forms are required to obtain all data elements listed. Either AFTO form 349 or AFSC form 258 can be used with AFFTC form 300 to collect most of the listed elements. As previously indicated, form 349 does not provide all the data elements contained on form 258. However, both contain the critical data elements needed for most quantitative R&M computations.

(c) Form 349 has blocks 14 and 15 unassigned for specific information; these two blocks can be used to collect additional data elements. AFSC form 258 has blocks F, 23, and 24 unassigned, which can similarly be designated for specific required elements. In both cases, the type of information that could be collected would depend on the test program being conducted.

(3) Logistics Data Sources.

During a test program, it is often necessary to determine the relative merits of one or more pieces of hardware. For certain logistics parameters, program documentation may not provide values for comparison with those achieved during OT&E activities. Several possible sources of documented values are available, as discussed below.

(a) Government/Industry Data Exchange Program (GIDEP).

As the name of this data program implies, both the Government and industry participate in the mutual exchange of information on all types of military hardware. GIDEP is managed by the Naval Material Command, Washington, D.C. The operations center is located at the Fleet Missile Systems Analysis and Evaluation Group, Corona, CA, where technical operations are carried out. Participants in the program are users, rather than manufacturers, of parts and components. Specialized data banks maintained within this storage and retrieval system are as follows:

1. The Engineering Data Bank contains engineering evaluation and qualification test reports, nonstandard parts justification data, parts/material specifications, manufacturing processes, failure analysis data, and

TABLE 4-3c. MATRIX OF DATA ELEMENTS VS. AIR FORCE FORMS (Sheet 1 of 2)

Data Element	AFTO Form 349	AFTO Form 350	AFSC Form 258	AFFTC Form 300	AFTO Form 781	AFTO Form 781A	AFTO Form 781E	AFTO Form 781F	AFTO Form 781H	AFTO Form 781J	AFTO Form 781K	AF Form 1534 (1)	AF Form 2445	AFTO Form 4	AFTO Form 208	AFTO Form 210E	AFTO Form 443	AFTO Form 444	AFTO Form 454	AFTO Form 136
	Primary Air Force Form																			
Job Control Number/Report Number*	X	X	X	X		X							X			X		X		
Work Center	X		X													X			X	
Date This Report	X	X	X	X	X	X			X	X	X	X		X	X	X	X	X	X	
Activity Identification	X		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
End Item (EI) Identification	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X
Serial Number EI	X		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
Possessed Time EI (Note 2)	X		X						X					X						
Time/Miles/Cycles/Events EI	X	X	X		X				X	X				X		X				
Number of Landings EI				X	X				X					X						
Number of Sorties EI	X			X	X															
Date of Mission				X	X															
Start of Mission (Time)				X	X															
End of Mission (Time)				X	X															
Mission Type				X	X															
Operating Mode/Mission Phase				X																
Time in Each Mode/Phase				X																
Manufacturer Failed Items (FI)			X																	
Serial Number FI	X	X	X										X							
Part Number FI	X	X	X																	
Time/Miles/Cycles/Events FI*	X	X	X																	
Work Unit Code (WUC)*	X	X	X	X									X			X	X	X		

*Critical for most R&M computations.

NOTES: (1) Engines only

(2) Check marks for these data elements consider possessed time and time/miles/cycles/events to be synonymous.

TABLE 4-3c. (Sheet 2 of 2)

Data Element	AFTO Form 349	AFTO Form 350	AFSC Form 258	AFFTC Form 300	AFTO Form 781	AFTO Form 781A	AFTO Form 781E	AFTO Form 781F	AFTO Form 781H	AFTO Form 781J	AFTO Form 781K	AF Form 1534 (1)	AF Form 2445	AFTO Form 4	AFTO Form 208	AFTO Form 210E	AFTO Form 443	AFTO Form 444	AFTO Form 454	AFTO Form 136
	Primary Air Force Form																			
When Discovered Code, Date, Time*	X	X	X	X		X										X		X		
How Malfunctioned Code*	X	X	X	X												X				
Action Taken Code*	X	X	X	X																
Type Maintenance Code*																				
Description of the Problem	X	X	X	X		X							X					X		
Corrective Action (Maintenance Action Taken)	X	X	X			X							X					X		
Piece Parts Replaced	X		X																	
Units Completed			X													X				
Manufacturer Installed Item (II)			X																	
Serial Number II	X		X				X					X		X	X					
Part Number II	X		X									X		X	X					
Time/Miles/Cycles/Events II	X		X				X			X(1)		X		X	X					
Air Force Specialty Code (AFSC)			X																	
Crew Size (by AFSC)*	X		X																	
Start Time (Maintenance)*	X		X										X							
Stop Time (Maintenance)*	X		X										X							
Delay Code (Maintenance)		X	X										X							
Support, General Maintenance	X	X	X																	
Nonsupport, General Maintenance	X	X	X																	

*Critical for most R&M computations.

NOTES: (1) Engines only

(2) Check marks for these data elements consider possessed time and time/miles/cycles/events to be synonymous.

other related engineering information on parts, components, materials, and processes. The bank includes a section of reports on specific engineering methodology and techniques.

2. The Failure Rate Data Bank (formerly FARADA) contains failure rate/mode data on parts and components based on field performance information and on reliability demonstration tests of operational systems and equipment. Not included in the computations are failures classified as secondary or accident-dependent, burn-in/infant mortality, wear-out, or unconfirmed.

3. The Metrology Data Bank contains test equipment calibration procedures and related metrology engineering data on test systems, calibration systems, and measurement technology.

4. The Failure Experience Data Bank contains failure information generated whenever significant problems are identified on parts and materials.

(b) Reliability Analysis Center.

The Reliability Analysis Center, an established DoD operation administered by the Rome Air Development Center (RADC), provides for the dissemination of reliability and experience information on microelectronic and discrete semiconductor devices. The center analyzes and disseminates information generated during all phases of device fabrication, testing, equipment assembly, and operation. Data files are continually updated through information collected from device and equipment manufacturers, system contractors, and field operations. Collection efforts concentrate on failure mode and mechanism analysis; material, device, and process technology; quality assurance and reliability practices; test results; and application experience. Information concerning this center can be obtained from RADC, Griffis Air Force Base, N.Y. 13440.

(c) Air Force Operational Test and Evaluation Management Information System (OTEMIS).

1. OTEMIS is an automated data system currently comprising three files of information:

a. Reports – Bibliographic information and abstracts of test plans, test reports, and studies relative to Air Force OT&E problems.

b. Status – Information on all AFTEC-managed/monitored test programs.

c. Data – Catalogs all available test data from AFTEC-conducted test programs.

2. The AFTEC Directorate of Analysis (OA) manages and is responsible for the reports and data files. The Directorate of Plans and Resources (XR) is responsible for the status file. Information concerning the

contents and usage of the reports and data files is provided in AFTECR 55-1, Chapter 11. Additional support concerning operation, usage and contents of OTEMIS can be obtained from XR.

(4) Configuration Management.

(a) Configuration management is the discipline of applying technical and administrative direction and surveillance to identify and document functional and physical characteristics of a configuration item; to control changes to these characteristics; and to record and report change processing and implementation status (DoD Directive 5010.19). Configuration management comprises configuration identification, configuration control, and configuration status accounting. The following definitions and terms, all from DoD Directive 5010.19, apply to this discipline.

1. Configuration Item (CI) – An aggregation of hardware/ software, or any of its discrete portions, that satisfy an end use function, and is designated by the Government for configuration management. CIs may vary widely in complexity, size, and type, for an aircraft system to a test meter or round of ammunition. During development and initial production, CIs are only those specification items that are referenced directly in a contract (or an equivalent in-house agreement). During the operation and maintenance period, any reparable item designated for separate procurement is a configuration item.

2. Configuration Identification – The currently or conditionally approved technical documentation for a configuration item as set forth in specifications, drawings and associated lists, and documents referenced therein.

3. Configuration Control – The systematic evaluation, coordination, approval, or disapproval, and implementation of all approved changes in the configuration of a CI after formal establishment of its configuration identification.

4. Configuration Status Accounting – The recording and reporting of the information needed to manage configurations effectively, including a listing of the approved configuration identification, the status of proposed changes to a configuration, and the implementation status of approved changes.

(b) When AFTEC receives an end item for test and evaluation, configuration management for that end item should have already been implemented by the contractor. That is, configuration identification, configuration control, and configuration status accounting activities should exist in accordance with AFLC/AFSC Manual 375-7, Configuration Management for Systems, Equipment, Munitions and Computer Programs. The exact configuration of each item to be tested should be documented and accompany the delivery of the end item. When more than one end item is to undergo test and evaluation, a comparison should be made between configurations to determine their degree of similarity, utilizing the deviations, waivers and shortages list. Differences in configurations can affect the test results and the conclusions reached from evaluating these results.

(c) The importance of configuration management to AFTEC is to assure that each end item under test is of the latest approved configuration, that each like end item comprises the same or nearly the same configuration items, and that an up-to-date status accounting is maintained concerning the incorporation of approved engineering change proposals (ECPs) and time compliance technical orders (TCTOs). Configuration management also provides a method for keeping track of special equipment installed on an end item for implementing unique mission applications.

(d) If configuration management techniques have not been applied or required on an end item, AFTEC should implement a manual program as follows:

1. Configuration items for each end item should be identified by name, manufacturer, serial number, part number, drawing number, and revision. Any special features or uses for these CIs should also be indicated.

2. A baseline should be established for each CI. This baseline is contingent upon the status of incorporated ECPs and TCTOs.

3. A listing of all approved ECPs and TCTOs should be obtained from the System Program Office (SPO), along with their development status.

4. A series of AFTO form 95s can then be prepared for each CI identified for the end item.

Thus a historical file is developed for each end item, and appropriate entries can be made as changes are incorporated.

(e) TO 00-20-4, Configuration Management Systems, delineates documentation requirements for both manual and automated configuration status reporting. Guidance is provided for the preparation of AFTO form 95, and four configuration status systems are described. Additional information and guidance can be obtained from the latest versions of Military Standards 480 through 483.

4-4. DATA REDUCTION AND ANALYSIS.

The possible types of information that may enter into logistics assessments are many and varied. This section provides guidance for the reduction and analysis of data associated with the parameters presented in tables 4-2a (Reliability), 4-2c (Maintainability), 4-2e (Availability), and 4-2g (Supportability). For large quantities of data, these techniques can also be implemented by one or more of the data processing systems discussed in section 4-5. A cross reference of parameters and data systems that will calculate these parameters is provided by table 4-5b. When a parameter can be used in the evaluation of more than one factor (e.g., mean time to repair is both a maintainability and availability parameter), it is discussed the first time it appears, but the discussion is not repeated for subsequent applications.

a. Reliability Parameters.

Criteria, ground rules, and basic equations for calculating the reliability parameters listed in table 4-2a are presented below. In all instances these calculations provide point estimates for each of the parameters. Statistical procedures for developing confidence intervals for these parameters are discussed in subsection 4-4e.

(1) Criteria and Ground Rules.

When evaluating the reliability parameters listed in table 4-2a, the following criteria and ground rules apply: (NOTE: In using these criteria and ground rules, failures should be recorded by categories for later use in problem area identification and end item evaluation.)

(a) Failures of redundant components will be included in computation of hardware MTBF, but not of flight reliability or inflight aborts. Only the one primary component causing an abort will be counted for flight reliability or inflight abort.

(b) The following will be counted as failures:

1. A component operated beyond its specified environmental and/or performance design limits, and/or maintenance requirements.

2. Equipment that fails even though not properly maintained.

3. Failures caused by maintenance or pilot error.

4. Secondary or induced failures.

5. Failures due to improper installation.

6. A repeat or recurring failure that was not confirmed when previously reported one or more times. (AFM 66-1 definitions of repeat and recurring failures apply.)

7. Failures of equipment not in its qualified/production configuration.

8. Equipment requiring adjustment or calibration to return it to a ready-for-installation status.

(c) If an item is damaged or maintenance errors induced by item design complexity, by poor design practice, or by following improper procedures that allow improper maintenance (e.g., interchangeability of connectors) without proper caution in the technical manuals, the failure shall be chargeable. Even when corrective action concerning the improper procedures or deficiencies has been completed, the failure shall not be deleted.

(d) Failure.

1. DO56 Data System Failure Categories.

a. Type 1 Failure. This category indicates that the item no longer can meet the minimum specified performance requirement due to its own internal failure pattern. (How malfunctioned codes not listed as type 2 or 6 below are considered to be type 1.) Only type 1 failures are used by DO56 to express MTBF.

1) The computer definition of a failure condition at the five-position WUC level is:

a) Any type 1 how malfunctioned code in combination with an action taken code F, K, L, or Z. (See appendix 4-2a for description of how malfunctioned and action taken codes.)

b) Any type 1 how malfunctioned code in combination with an action taken code P or R, provided that the removed item was not found serviceable (action taken code B) at the bench check station.

2) The computer definition of a failure condition at the two- and three-position WUC level (system and subsystem) is the same as at the five-position WUC level, plus any type 1 how malfunctioned code in combination with action taken code G for each five-position WUC. (At the five-position WUC level, action taken code G with a type 1 how malfunctioned code is identified as "Other Malfunction".)

b. Type 2 – Induced Failure. These how malfunctioned codes, when used with action taken codes F, G, K, L, P, R, or Z, indicate that the item no longer meets minimum specified performance requirement due to some induced condition and not due to its own internal failure pattern: 086, 092, 105, 106, 108, 158, 168, 204, 230, 246, 301, 303, 424, 447, 518, 553, 602, 638, 639, 697, 698, 709, 731, 877, 878, 931, 942, 948.

c. Type 6 – No Defect. These codes indicate that maintenance resources were expended due to policy, modification, location, or

cannibalization and no defect existed at the time of maintenance: 632, 793, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 812, 911.

2. MDC Failure Categories.

a. CODE A DATA CLASS – FAILURE. An on-equipment record containing a how malfunctioned code other than those listed for codes B, C, or D below. Only code A is used in determining failure data for the performance monitoring system. These how malfunctioned codes are included in the failure count unless combined with action taken code Q or Y.

b. CODE B DATA CLASS – INDUCED FAILURE. An on-equipment record containing how malfunctioned code 086, 092, 105, 106, 108, 158, 167, 204, 230, 246, 301, 303, 447, 424, 518, 553, 602, 638, 639, 697, 698, 709, 731, 750, 877, 878, 931, or 942. Code B records are not included in the high-25 on-equipment failures, PCN SG001B781.

c. CODE C DATA CLASS – NON-FAILURES. An on-equipment record containing how malfunctioned code 142, 143, 632, 796, 799, 800, 803, 812 948 or 804 and type maintenance code not T or Z. Also included are A or B how malfunctioned codes in combination with action taken codes Y or D. (Note that DO56 includes codes 142 and 143 as type 1 failures.)

d. CODE D DATA CLASS – NO DEFECT, TCTO. An on-equipment record containing type maintenance code T or Z and how malfunctioned code 793, 797, 798, 801, 802, 804, or 911. (Note: See appendix 4-2A for MDCS data class codes and how malfunctioned codes.)

(e) Other Malfunctions. Other malfunction occurrences are defined (DO56) as:

1. Any type 1 how malfunctioned code in combination with an action taken code G at the five-position WUC. At the system/subsystem (74XXX/741XX) level, a type 1 how malfunctioned code with action taken code G is accumulated and shown as a failure and not as another malfunction.

2. Type 2 how malfunctioned code and all action taken codes listed in paragraphs 4-4a(1)(d)1 and 2 above.

NOTE: The definitions in paragraph (e) apply to DO56B5505, DO56B5006, and DO56B5527 products.

(f) Total Occurrences (DO56). On-equipment occurrences are reported under all valid how malfunctioned codes (types 1, 2, and 6) and all action taken codes listed in paragraphs 4-4a(1)(d)1 and 2 above, plus E, H, J, S, V, and X. This expression is used in the DO56B5006 for MTBM. Time change events are included. (NOTE: There is no satisfactory DO56 source of off-equipment maintenance actions that would be comparable to shop, or off-equipment, man-hours as used in the DO56B5006. Shop action units used in the

DO56B5006 do not include components that are bench checked and require no repair (action taken codes B, J, and X), in-shop support general work, or work associated with action taken codes C, D, M, and N. The DO56B5505, Part II – Shop Actions, includes serviceables (action taken codes B and J) and delay codes C, D, M, and N, but omits action taken code X events and in-shop support general activity. Further, the DO56B5505 is produced only when a work unit coded item exceeds its assigned failure limit or drops below the assigned minimum acceptable reliability factor. While this product may be useful for work unit code studies, it would not be a practical source of data for systems or mission, design, and series (MDS) purposes.

(g) Only when discovered codes A (before-flight abort) and C (in-flight abort) are used by DO56B5006 and DO56B5015 to determine aborts. All type 1 and 2 how malfunctioned codes and the following action taken codes are qualification for an abort:

Type Maint.	Description
F	Repair
G	Repair and/or replacement of minor parts, hardware, and soft goods
K	Calibrated - adjustment required
L	Adjust or reset
P	Removed
R	Remove and replace
Z	Corrosion treatment

NOTE: More than one work unit code may be reported for a single abort, thereby overstating the abort rate. Abort rates are included only in the DO56B5015 (based on sorties) and the DO56B5527 (based on flying hours) products.

(h) The when discovered codes listed below reflect aborts, mission failures or degraded alerts reported against the indicated end items. AFLC summarizes this information through a count of the K97 cards received with other than "zero" units reported. The count reflected for "on-equipment" actions may be duplicated by "off-equipment" actions. By comparative analysis of the two maintenance environments (line or shop) and the item affected, a relatively true assessment of abort causes can be made. Only the following codes are used in DO56B5007 for the end articles indicated.

When Discovered Code	Definition
	For Aircraft, Mobile Training Units, Air Launched Missiles, and Aircraft Engines
A	Before Flight-Abort-Air Crew
C	In Flight-Abort
N	Ground Alert-Degraded
	For Ground Launched Missiles and Real Property Installed Equipment
A	Countdown-Abort
C	Simulated Countdown-Abort
H	Ground Alert/Operationally Ready-Degraded
P	Functional/Operational Check-Result Bad
	For Registered AGE, Trainers, Simulators, Missile Class 1 Trainers, Ground CEM and L Systems
C	During Equipment Operation/Caused Equipment Downtime
	For Munitions
C	During Operation

NOTE: DO56B5007 lists aborts by WUC, date, and operating time for each equipment serial number in determining abort count, but no abort rate or sortie count is provided.

(i) Before-Flight Abort. If an attempted sortie does not become airborne because of a failure, the criterion used will be that applied by the predominant using command for operational forces. For example, in TAC an abort occurs when an aircraft fails to take off within 2 hours of scheduled takeoff time due to maintenance discrepancies or other causes discovered or occurring after the scheduled aircrew station time. For determining aborts, the scheduled takeoff time for aircraft is that agreed upon by maintenance and operations personnel prior to crew arrival.

(j) Inflight-Abort. An airborne aircraft cannot effectively accomplish its primary or alternate scheduled mission due to a reported malfunction.

NOTE: Equations for a number of parameters presented in this and subsequent subsections are modified by an inventory ratio. This

is a method of prorating data from a population of similar items to those end items having some special configuration or feature. When a small number of end items (fewer than 6) are undergoing OT&E, caution should be exercised in using this approach. Small numbers of end items should be tracked by tail number, serial number, or some other specific identification. Data accuracy will be improved and the analysis effort will result in more realistic parametric evaluations.

(2) Equations.

(a) Mean Time Between Failures (MTBF).

1. For aircraft, AGM 28's, AGM 69A's, and aircraft engines, the DO45 formula is:

$$\text{MTBF} = \frac{\text{(Flight Hours) (Use Factor) (QPA)}}{\text{Quantity of Failure Occurrences}} \times \frac{\text{Special Inventory}}{\text{Aircraft Inventory}}$$

where:

Flight Hours are the accumulation of all flying hour readings for the same period of time for which failures were accumulated.

Use Factor is the ratio of item operating time to flying hours. (For OT&E reports the ratio used, if other than 1.0, should be so stated.)

Quantity of Failure Occurrences is the accumulation of failure occurrences during the same period covered by the operating time. The criteria and ground rules of para. 4-4a(1) must be applied in determining these failure occurrences.

Special Inventory is the number of different aircraft configurations when all test items are not equipped with one or more particular WUC components.

Aircraft Inventory is the number of aircraft under test.

2. For equipment other than aircraft and specified missiles the DO56 formula is:

$$\text{MTBF} = \frac{\text{(Operating Time) (Use Factor) (QPA)}}{\text{Quantity of Failure Occurrences}} \times \frac{\text{Special Inventory}}{\text{Test Inventory}}$$

where:

Operating Time is the accumulation of actual hours that an item is in operation based on ETI readings, or is the possessed time for that item. When information is available, NOR grounded time may be subtracted from possessed time to determine operating time when the latter is not reported separately, although this practice is not applied in the DO56

products. For ground and air-launched missiles (other than AGM-28 and AGM-69), CEM, trainers and simulators, munitions, and registered AGE, the operating time entry in the DO56 will be: AFR 65-110 or B-4 master inventory × 30 days × inventory ratio.

Use Factor is the ratio of item operating time to possessed time. This ratio is 1.00 when operating time is used in lieu of ETI readings.

Quantity per Application, Quantity of Failure Occurrences, and Special Inventory are as defined for aircraft.

Test Inventory is the total number of items under test.

(b) Failure rate (λ).

For aircraft and other equipment with exponential failure distributions, the failure rate usually is expressed as:

$$\lambda = \frac{1}{MTBF}$$

where the preceding definitions for calculating MTBF are applicable.

(c) Total Maintenance Actions/1000 Flight Hours (DO56B5527).

$$\text{Rate} = \frac{\text{(Total Quantity of Maintenance Actions) (1000)}}{\text{Flight Hours}} \times \frac{\text{Special Inventory}}{\text{Test Inventory}}$$

1. Total maintenance actions are accumulated in accordance with para. 4-4a(1)(f). This rate can also be expressed as "Failure Occurrences/1000 Flight Hours" by applying the criteria of para. 4-4(a)(1)(d) or as "Other Malfunction Occurrences/1000 Flight Hours" by applying the criteria of para. 4-4a(1)(e). Each of these parameters may require assessment, depending on the type of information required to evaluate aircraft characteristics.

2. Definitions for data elements other than failure occurrences are provided under para. 4-4a(2)(a).

(d) Aborts/1000 Flight Hours (D056B5527).

Aborts are divided into two categories: before flight and in-flight. Each of these is expressed as a rate computation per 1000 flight hours

that are based on reported actions from the on-equipment maintenance environment. These rates are calculated as follows:

1. Before-Flight Aborts (BFA).

$$\text{Rate} = \frac{\left(\begin{array}{c}\text{Aborts Accumulated for} \\ \text{When Discovered Code A}\end{array}\right)(1000)}{\text{Flight Hours}} \times \frac{\text{Special Inventory}}{\text{Test Inventory}}$$

2. In-Flight Aborts (IFA).

$$\text{Rate} = \frac{\left(\begin{array}{c}\text{Aborts Accumulated for} \\ \text{When Discovered Code C}\end{array}\right)(1000)}{\text{Flight Hours}} \times \frac{\text{Special Inventory}}{\text{Test Inventory}}$$

3. When discovered codes are provided in appendix 4-2A. Other terms have already been defined.

(e) Aborts.

1. Total Aborts/1000 Sorties Flown (DO56B5015).

$$\text{Rate} = \frac{\left(\begin{array}{c}\text{Aborts Accumulated for When} \\ \text{Discovered Codes A and C}\end{array}\right)}{\text{Sorties Flown}} \times 1000$$

where:

Sorties are the sum of successful missions and in-flight aborts for some specific time period. Another way of expressing this term is in aircraft takeoffs over the time span for which the aborts were accumulated. (NOTE: Care should be taken in the use of the above equation. The numerator includes both before-flight and in-flight aborts. The denominator reflects only aircraft takeoffs and not total attempted missions. Therefore, significant changes in the number of before flight aborts may cause extreme variations from rates computed as described below.)

2. Alternate Abort Rates.

Although not used in the DO56 data system, a more conventional method of expressing abort rates is based upon the Maintenance Data Collection System. The equations for these rates are:

a. Before-Flight Aborts.

$$\text{Rate} = \frac{\text{Before-Flight Aborts}}{(\text{Sorties Flown}) + (\text{Before-Flight Aborts})}$$

b. In-Flight Aborts.

$$\text{Rate} = \frac{\text{In-Flight Aborts}}{\text{Sorties Flown}}$$

c. Total Aborts.

$$\text{Rate} = \frac{(\text{In-Flight Aborts}) + (\text{Before-Flight Aborts})}{(\text{Sorties Flown}) + (\text{Before-Flight Aborts})}$$

(f) Failure Occurrences/1000 Operating Hours.

$$\text{Rate} = \frac{(\text{Quantity of Failure Occurrences})(1000)}{\text{Operating Time}} \times \frac{\text{Special Inventory}}{\text{Test Inventory}}$$

This parameter is generally associated with equipment other than aerospace vehicles, e.g., AGE, CEM equipment, trainers, and simulators. Failure occurrences are accumulated in accordance with para. 4-4a(1)(d). DO56 products for CEM, simulators and trainers, ground and air launched missiles, and weapons use possessed time for operating time.

Operating Time is the cumulative time that an item has been in operation, based on ETI readings or historical records. NOTE: If specific ETI readings are available for the special configured items, the inventory ratio need not be used.

(g) Percent Failures by When Discovered Code (DO56B5527).

1. Before Flight.

$$\text{Percent Failures} = \frac{\left(\begin{array}{c}\text{Failure Occurrences Accumulated for} \\ \text{When Discovered Codes A \& B}\end{array}\right)}{\text{Failure Occurrences}} \times 100$$

2. In Flight.

$$\text{Percent Failures} = \frac{\left(\begin{array}{c}\text{Failure Occurrences Accumulated for}\\ \text{When Discovered Codes C \& D}\end{array}\right)}{\text{Failure Occurrences}} \times 100$$

3. Between Flights.

$$\text{Percent Failures} = \frac{\left(\begin{array}{c}\text{Failure Occurrences Accumulated for}\\ \text{When Discovered Codes E, F, G, H, J, N, V, and 3}\end{array}\right)}{\text{Failure Occurrences}} \times 100$$

4. During Inspection.

$$\text{Percent Failures} = \frac{\left(\begin{array}{c}\text{Failure Occurrences Accumulated}\\ \text{for When Discovered}\\ \text{Codes K, M, P, Q, R, T, U, W, X, Z, 2, \& 4}\end{array}\right)}{\text{Failure Occurences}} \times 100$$

5. Failure occurrences are defined in para. 4-4a(1)(d). When discovered codes are presented in appendix 4-2A. Failure occurrences are derived from on-equipment actions.

(h) Reliability (Percent).

1. Mission Reliability =

$$\left[1 - \frac{\text{Before-Flight Aborts} + \text{In-Flight Aborts}}{\text{Sorties} + \text{Before-Flight Aborts}}\right] \times 100$$

2. Before-Flight Reliability =

$$\left[1 - \frac{\text{Before-Flight Aborts}}{\text{Sorties Flown} + \text{Before-Flight Aborts}}\right] \times 100$$

3. In-Flight Reliability =

$$\left[1 - \frac{\text{In-Flight Aborts}}{\text{Sorties Flown}}\right] \times 100$$

where:

Before-Flight Aborts are defined in para. 4-4a(1)(i)

In-Flight Aborts are defined in para. 4-4a(1)(j)

Sorties are defined in para. 4-4a(2)(e).

b. Maintainability Parameters.

The equations for calculating the maintainability parameters listed in table 4-2c are presented below. Again, these are point estimates of each parameter. Applicable statistical techniques are discussed in subsection 4-4e.

(1) Criteria and Ground Rules.

When evaluating the maintainability parameters listed in table 4-2c, the following ground rules apply.

(a) Man-hours expended on TCTOs and ECPs will be reported and included in the computation of man-hours per flying hour.

(b) Personnel dispatched to observe maintenance for training purposes only will not be identified on AFSC form 258/AFTO form 349 as a part of the crew. Personnel in a training status that are dispatched to perform the maintenance task as a member of the repair crew will be identified on AFSC form 258/AFTO form 349, and their man-hour expenditures documented accordingly.

(c) All man-hours expended on deferred maintenance will be documented except those expended by the contractor to bring the end item to the contract-specified test configuration.

(d) Man-hours spent researching manuals, technical orders, etc., will be reported if directly related to a specific maintenance task.

(e) Man-hours spent accumulating tools necessary for a maintenance task will be reported.

(f) Man-hours expended taxiing or towing an aircraft incident to a maintenance task will be reported.

(g) Man-hours expended in transportation to and from the job, not to exceed 0.5 hour round trip per man; delays at the job, not to exceed 15 minutes per man; the actual repair; cleanup directly related to the task; and required form entries will be reported.

(h) Maintenance debriefing man-hours will not be reported unless done at the aircraft as part of the troubleshooting or analysis/troubleshooting portion of the task.

(i) Man-hours expended in cannibalization will be reported.

(j) Man-hours expended solely for preparing for or standing by for static display will not be reported. Man-hours expended in inspections and repairs as a result of aerial demonstrations will be reported.

(k) Man-hours expended in direct support of development, test, and evaluation (DT&E) tasks (towing aircraft to evaluate a tow bar, repair of test instrumentation, etc.) will not be used for evaluations of maintainability.

(l) If an item is damaged or maintenance errors induced by item design complexity, by poor design practice, or by following improper procedures that allow improper maintenance (e.g., interchangeability of connectors) without proper caution in the technical manuals, the maintenance times will be chargeable. Even when corrective action concerning the improper procedures or deficiencies has been completed, the maintenance times (man-hours) will not be deleted.

(m) If personnel are required on an intermittent or sequenced basis, the man-hours assessed against the maintenance task will include the required standby time only if that time is of a type or duration that prevents standby personnel from performing other productive tasks.

(n) Man-hours are the sum of productive direct man-hours reported by work unit code or TCTO data code. Various categories of man-hours are identified below. (NOTE: Type maintenance codes shown below apply to the DO56B5006 reports which portray man-hour expenditures but not man-hours per flight hour data.)

1. Scheduled. Scheduled man-hours are those spent on scheduled maintenance and reported by the following type maintenance codes as listed in AFM 300-4, Volume XI:

a. For aircraft (including installed engines), drones, and related mobile training sets and resident training equipment:

Type Maint.	Description
A	Service
C	Basic postflight or thru flight inspection
D	Preflight inspection
E	Hourly postflight or minor inspection
H	Home station check
J	Scheduled calibration of equipment or components
M	Interior refurbishment

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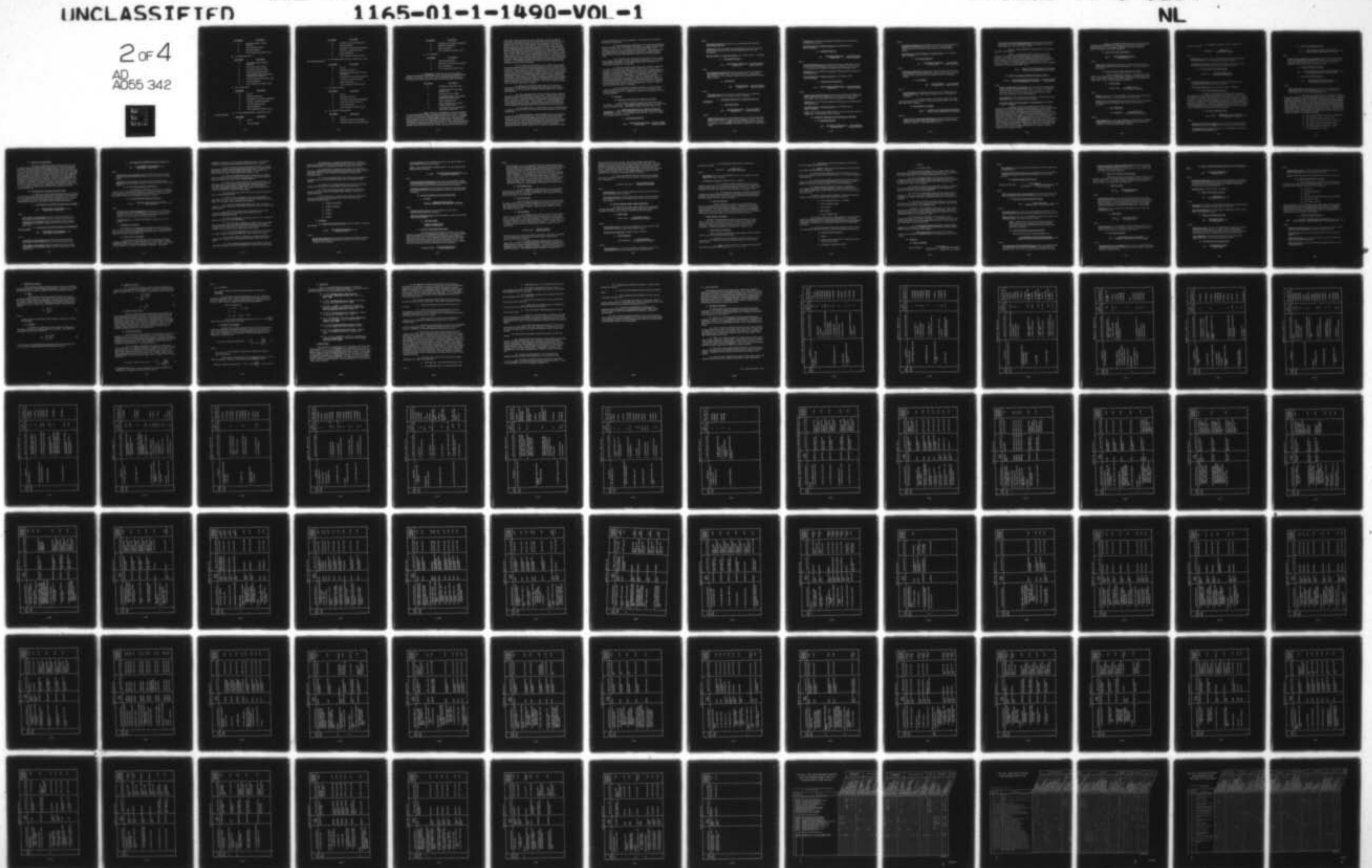

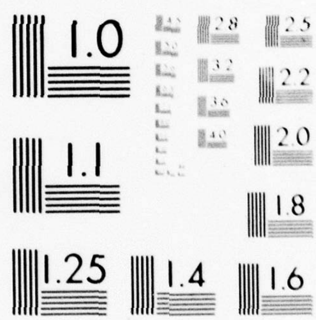

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Type Maint.	Description
P	Periodic, phased, or major inspection
Q	Forward support spares
R	Depot maintenance
T	Time compliance technical order

b. For engine shop work:

Type Maint.	Description
A	Gas turbine engine scheduled inspection
C	Gas turbine engine buildup
D	Gas turbine engine teardown
H	Reciprocating engine buildup
K	Reciprocating engine teardown and preparation for shipment
Q	Forward support spares (MAC only)
R	Depot maintenance
T	Time compliance technical order

c. For common AGE:

Type Maint.	Description
A	Service
D	Scheduled inspection
J	Calibration of operational equipment
P	Periodic or phased inspection
Q	Forward support spares
R	Depot maintenance
T	Time compliance technical order

d. For air launched missiles, related AGE, and training equipment:

Type Maint.	Description
A	Service
C	Basic postflight

Type Maint.	Description
D	Preflight or scheduled inspection
E	Hourly postflight
J	Calibration of operational equipment
P	Periodic or phased inspection
R	Depot maintenance
T	Time compliance technical order

e. For ground launched missiles, related AGE, CEM, and training equipment:

Type Maint.	Description
A	Service
D	Scheduled inspection
F	Scheduled ground launched missile maintenance
J	Calibration of operational equipment
P	Periodic or phased inspection
R	Depot maintenance
T	Time compliance technical order

f. For Class I trainers:

Type Maint.	Description
A	Service
D	Scheduled inspection
J	Calibration of operational equipment
P	Periodic or phased inspection
R	Depot maintenance
T	Time compliance technical order

g. For ground CEM equipment:

Type Maint.	Description
A	Service
D	Scheduled inspection daily/shift
F	Scheduled inspection phased/periodic

Type Maint.	Description
J	Calibration of operational equipment
P	Scheduled maintenance
R	Depot maintenance
T	Time compliance technical order

h. For munitions:

Type Maint.	Description
A	Scheduled Maintenance
J	Calibration of operational equipment
R	Depot maintenance
T	Time compliance technical order

2. Unscheduled — These are the man-hours spent as unscheduled maintenance and reported by the following type maintenance codes as listed in AFM 300-4, Volume XI. For the equipment listed above, the following codes as they apply are considered to be unscheduled maintenance:

Type Maint.	Description
B	Unscheduled maintenance (all)
E	Unscheduled test cell operation (engines only)
H	Emergency on-site (CEM)
L	Reciprocating engine intermediate maintenance (engines only)
S	Special inspection (all)
W	Minor maintenance on removed engines (engines only)
Y	Transient aircraft or transient in-shop engine maintenance

3. Shop. These are "off equipment" man-hours expended by shop maintenance personnel in checking/repairing items removed from the end article and which are charged to each work unit code. (NOTE: DO56B5006 provides man-hours and man-hour/flight hour data on selected aircraft only. When available it is the best DO56 source for MH/FH data. Scheduled and unscheduled man-hours are broken out by system. Summary man-hour data are also shown for support general WUCs and for TCTOs. The Weapon Subtotal line contains system man-hour data only. The Weapon Grand Total line is the sum

of the support general man-hours, TCTO man-hours, and weapon subtotal man-hours. The flying time shown at the end of the report divided into the last Weapon Ground Total entry equals the sum of the man-hour per flying hour number in the "Org" and "Field" columns. The DO56B5006 "shop" entry will include programmed depot maintenance man-hours if any have been expended. Depot component overhaul data are not included in the "shop" values. Man-hour figures in the scheduled and unscheduled columns are on-equipment man-hours only. In-shop engine man-hours are not included in these two columns or in the "Shop" column. The "Shop" column includes bench check serviceable man-hours (action taken code B or J, with how malfunctioned code 799). This column does not relate directly to the Shop Action Units column, which does not include bench check serviceable actions, although programmed depot maintenance actions are included. Use DO56B5025 man-hour per flying hour data for comparison with operational craft on a fleet-wide basis.

(o) All man-hours documented in WUCs 01XXX through 09XXX in accordance with the above criteria will generally be used to compute support general man-hours, and WUCs 11XXX through 99XXX will be used for corrective man-hours. Type maintenance code T and equipment class codes must be used to obtain TCTO man-hour expenditures. (NOTE: DO56 products usually include support general codes in the 03XXX and 04XXX categories only. Although the DO56B5527 includes man-hour per flight hour figures, no support general data are included. DO56 man-hours data must be used with caution since all support general codes may not be included.) Man-hour expenditures as outlined above will be reported to the nearest 0.1 man-hour. AFTO form 349 start/stop times will be recorded to the nearest 5 minutes.

(p) Mean active downtime is that portion of test inventory possessed hours expended in active maintenance, inspection, and corrective maintenance. It does not include servicing, loading, standby alert, flying, or dead shift time.

(q) Quick turnaround time will have different criteria based on the weapon system and configuration to be generated. In general it is the total elapsed clock hours required between missions, under ideal conditions, to prepare an aircraft for immediate relaunch, including the loading of expendables (fuel, ammunition, bombs, etc.). All personnel, GSE, and expendables are pre-positioned, with time usually starting at engine shutdown and ending with aircrew acceptance and engine start and ready-to-taxi of the turned aircraft.

(r) Dead shift time (e.g., the third shift in a two-shift operation) is counted for turnaround time, but not for mean active downtime or quick turnaround time.

(s) Mean man-hours to repair (MMTR) is based on man-hours required to accumulate technical data, set up test equipment, perform and analyze results of troubleshooting tests and procedures, isolate the failed component, obtain a replacement (including delivery and administrative delays up to 15 minutes per man), perform the repair and verification, and perform cleanup and put-away directly associated with the specific component/ equipment repaired. Similar criteria will be applied to components for which

reported malfunctions could not be duplicated. The times will be reported to the nearest 0.1 man-hour.

(t) Mean time between maintenance (or on-equipment maintenance actions) is based on how malfunctioned codes (types 1, 2, and 6) and action taken codes E, F, G, H, J, K, L, P, R, S, V, X, and Z (DO56B5006). This algorithm is also used for accumulating total occurrences. Excluded from both are cannibalization, off-equipment repair, NRTS action, installation (action taken code Q), troubleshooting (action taken code X), and all support general work.

(u) Turnaround time includes the time needed for active maintenance, supply, administrative delay, and inactive maintenance due to personnel nonavailability (dead shift). It also includes that time for which there is no operational requirement for the aircraft.

(v) Not Operationally Ready, Maintenance (NORM) is applicable to all types of equipment (aircraft, missiles, CEM, trainers, etc.). For aerospace vehicles and trainer equipment, this parameter is separated into two categories: grounded and flyable. Within each category a further breakdown is scheduled and unscheduled maintenance. For CEM equipment, reduced capability can be indicated. The criteria of AFR 65-110 are applicable. For other types of equipment such as AGE and PME, the breakdown is limited to scheduled and unscheduled maintenance. Unscheduled maintenance man-hours are accumulated from the type of maintenance codes listed in para. 4-4b(1)(n)2. Scheduled maintenance man-hours are accumulated from the type of maintenance codes provided in para. 4-4b(1)(n)1.

(w) Not Repairable This Station (NRTS) is associated with off-equipment maintenance actions at the base level, and is an indication of the repair capability at that level. Maintenance man-hours are expended in making this determination.

(2) Equations.

(a) Maintenance Man-Hours per Flight Hour (MH/FH).

The primary source for man-hour per flight-hour data is DO56B5025. DO56B5527, "Maintainability Reliability Summary", also lists man-hour per flying hour data. Care should be taken in selecting either source.

1. Maintenance Man-Hours per Flight Hour (MH/FH) (DO56B5527). This product is available for aircraft only, and provides information for two-, three-, or five-position work unit codes. There is no option for a weapon system level report.

a. On-Equipment (MH/FH).

$$\text{Rate} = \frac{\text{On-Equipment Man-Hours}}{\text{Flight Hours}} \times \frac{\text{Aircraft Inventory}}{\text{Special Inventory}}$$

where:

On-Equipment Man-Hours is the sum of on-equipment labor expended, except support general.

Flight Hours is the accumulation of total flying hours for all test aircraft over the same time period for which on-equipment man-hours were accumulated.

Special Inventory and Aircraft Inventory are as defined in para. 4-4a(2)(a)1.

b. Off-Equipment MH/FH.

$$\text{Rate} = \frac{\text{Off-Equipment Man-Hours}}{\text{Flight Hours}} \times \frac{\text{Aircraft Inventory}}{\text{Special Inventory}}$$

where

Off-Equipment Man-Hours (shop hours) are the sum of all off-equipment labor expended in WUC series 11XXX through 99XXX. Excluded are support general, depot, and items withdrawn from supply (when discovered code Y) actions.

c. Total MH/FH.

$$\text{Rate} = \frac{\text{Total Man-Hours}}{\text{Flight Hours}} \times \frac{\text{Aircraft Inventory}}{\text{Special Inventory}}$$

where:

Total Man-Hours are the sum of all on-equipment and off-equipment maintenance man-hours as defined in para. 4-4b(2)(a)1.

2. Maintenance Man-Hour Per Flight Hour (MH/FH) (DO56B5025).

a. Scheduled MH/FH.

$$\text{Rate} = \frac{\text{Scheduled Man-Hours}}{\text{Flight Hours}} \times \frac{\text{Aircraft Inventory}}{\text{Special Inventory}}$$

where:

Scheduled Man-Hours are all scheduled man-hours by system (other than support general and TCTO) based on type maintenance codes A, C, D, E, H, J, M, P, Q, and R. (NOTE: This DO56 product applies to selected aircraft only.) See paragraph 4-4b(1)(n)1 for meaning of type maintenance codes.

Flight Hours are defined in paragraph 4-4b(2)(a)1, and are shown at the end of the DO56 product.

Aircraft Inventory and Special Inventory are as defined in paragraph 4-4a(2)(a)1.

b. Unscheduled MH/FH.

$$\text{Rate} = \frac{\text{Unscheduled Man-Hours}}{\text{Flight Hours}} \times \frac{\text{Aircraft Inventory}}{\text{Special Inventory}}$$

where

Unscheduled Man-Hours are all man-hours by system (other than support general and TCTO) as defined by use of type maintenance codes B, S, and Y. See paragraph b-4b(1)(n)2 for meaning of type maintenance codes.

Flight Hours are as defined in paragraph 4-4b(2)(a)1, and are shown at the end of the product.

Aircraft Inventory and Special Inventory are as defined in paragraph 4-4a(2)(a)1.

c. Weapon Grand Total MH/FH.

$$\text{Rate} = \frac{\text{Weapon Grand Total Man-Hours}}{\text{Flight Hours}} \times \frac{\text{Aircraft Inventory}}{\text{Special Inventory}}$$

where

Weapon Grand Total Man-Hours are the sum of work unit code 03XXX, and 04XXX support general, work unit code 11XXX-99XXX system subtotal, and aircraft TCTO, commodity TCTO, and engine TCTO subtotals.

Flight Hours are as defined in paragraph 4-4b(2)(a)1, and are shown at the end of the product.

Aircraft Inventory and Special Inventory are as defined in paragraph 4-4a(2)(a)1.

NOTE: This product lists the MH/FH figures at each of the three levels of maintenance: organizational, field, and depot.

(b) Maintenance Man-Hours per Operating Hour (MH/OH).

1. On-Equipment MH/OH.

$$\text{Rate} = \frac{\text{On-Equipment Man-Hours}}{\text{Operating Time}} \times \frac{\text{Test Inventory}}{\text{Special Inventory}}$$

where:

On-Equipment Man-Hours (except DO56) are the sum of on-equipment labor expended for all support general WUCs and all on-equipment labor expended on WUCs requiring preventive and corrective maintenance actions.

Operating Time, Special Inventory and Test Inventory are as defined in para. 4-4a(2)(a)2.

2. Off-Equipment MH/OH.

$$\text{Rate} = \frac{\textit{Off-Equipment Man-Hours}}{\text{Operating Time}} \times \frac{\text{Test Inventory}}{\text{Special Inventory}}$$

where:

Off-Equipment Man-Hours (shop hours), except for DO56, are the sum of all off-equipment labor expended for all support general WUCs and all off-equipment labor expended on WUCs requiring corrective maintenance actions.

3. Total MH/OH.

$$\text{Rate} = \frac{\text{Total Man-Hours}}{\text{Operating Time}} \times \frac{\text{Test Inventory}}{\text{Special Inventory}}$$

where:

Total Man-Hours (except DO56) are the sum of all on equipment and off-equipment maintenance man-hours as defined in para. 4-4b(2)(a)1 and 4-4b(2)(a)2.

4. The above parameters are usually applicable to equipment other than aerospace vehicles. AGE, ground CEM, trainers, and simulators fall into this category.

(c) Mean Man-Hours to Repair.

$$\text{MMTR} = \frac{\text{Total Corrective Maintenance Man-Hours}}{\text{Total Corrective Maintenance Occurrences}}$$

where:

Total Corrective Maintenance Man-Hours are the sum of all off- and -on equipment maintenance man-hours expended on WUCs (11XXX through 99XXX) requiring corrective maintenance actions.

Total Corrective Maintenance Occurrences are the sum of the unit count for all type 1 and 2 how malfunctioned codes in combination with action taken codes A, F, G, K, L, P, R, V, and Z.

NOTE 1: These definitions are applicable to all equipment, subsystems, and systems.

NOTE 2: Data systems as they currently exist do not accumulate clock hours as part of the summary of information from AFTO form 349. An estimate of MTTR can be obtained by dividing MMTR by the average number of personnel utilized in performing the corrective maintenance tasks. If possible, an automated program to calculate MTTR should be developed. However, a manual summary of elapsed clock hours can be obtained from the 349 forms by test personnel. Then:

$$\text{MTTR} = \frac{\text{Total Corrective Maintenance Clock Hours}}{\text{Total Corrective Maintenance Occurrences}}$$

(d) Mean Time Between Maintenance (Actions), MTBM.

$$\text{MTBM} = \frac{\text{(Operating Time)(Use Factor)(QPA)}}{\text{Quantity of Maintenance Occurrences}} \times \frac{\text{Special Inventory}}{\text{Test Inventory}}$$

where:

Quantity of Maintenance Occurrences is the sum of the on-equipment unit count for all how malfunctioned codes (types 1, 2, and 6) in combination with action taken codes E, F, G, H, J, K, L, P, R, S, V, X, and Z during the same time period covered by the operating time, with the above "type maintenance code" criteria applied.

Operating Time is the accumulation of flying time or operating time from historical records or ETIs for items so equipped.

Use Factor, QPA, Special Inventory and Test Inventory are as defined in para. 4-4a(2)(a)2.

NOTE 1: There is no satisfactory DO56 source of off-equipment maintenance actions that would be comparable to shop (off-equipment) man-hours as used in the DO56B5006. The shop action units used in the DO56B5006 do not include components that are bench checked and require no repair (action taken codes B, J, and X), in-shop support general work, or work associated with action taken codes C, D, M, and N. The DO56B5505, Part II – shop actions, includes serviceables (action taken codes B and J) and delay codes C, D, M, and N, but omits action taken code X events and in-shop support general activity. Further, the DO56B5505 is produced only when a work unit coded item exceeds its assigned failure limit or drops below the assigned minimum acceptable reliability factor. While this product may be useful for WUC studies, it would not be a practial source of data for systems or mission, design and series (MDS) purposes.

NOTE 2: Although the DO56 products do not provide MTBM scheduled and MTBM unscheduled values, these data could be obtained by applying the criteria in paragraphs 4-4b(1)(n)1 for scheduled and paragraph 4-4b(1)(n)2 for unscheduled categories.

(e) Mean Active Down Time (MADT).

$$\text{MADT} = \frac{\text{Total Active Downtime Hours}}{\text{Possessed Hours}}$$

where:

Total Active Downtime Hours comprise all scheduled and unscheduled on-equipment maintenance time and inspections. All time is expressed in clock hours.

(f) Not Operationally Ready, Maintenance (NORM).

NORM encompasses two categories: grounded and flyable. Within each category a further breakdown is scheduled and unscheduled maintenance. NORM rates can be based on either all grounded or all grounded and flyable hours. The following formulas are applicable:

1. NORM-G Rate.

$$\text{NORM-G Rate} = \frac{\text{NORM-G Hours}}{\text{Aircraft Hours Possessed}}$$

where:

NORM-G Hours are the sum of NORM-G unscheduled and scheduled hours for the test inventory over the time period being evaluated.

Aircraft Hours Possessed is the sum of the total clock hours accumulated for the test inventory during the time period associated with the evaluation.

2. Total NORM Rate.

$$\text{Total NORM Rate} = \frac{\text{Total NORM Hours}}{\text{Aircraft Hours Possessed}}$$

where:

Total NORM Hours are the sum of NORM-G unscheduled hours, NORM-G scheduled hours, and all NORM flyable (NORM-F) hours for the test inventory over the time period under evaluation.

3. For equipment other than aircraft, a NORM rate is calculated as follows:

$$\text{NORM Rate} = \frac{\text{NORM Hours}}{\text{Total Hours Possessed}}$$

where:

NORM Hours are the sum of all scheduled and unscheduled NORM hours for the test inventory over the time period of the evaluation.

Total Hours Possessed is the sum of the total clock hours accumulated for the test inventory during the time period under evaluation.

(g) Not Repairable This Station (NRTS).

$$\text{NRTS Index} = \frac{\text{Total NRTS Man-Hours}}{\text{Off-Equipment Man-Hours}}$$

where:

Total NRTS Man-Hours are the sum of all off-equipment man-hours accumulated for action taken codes 1 through 9.

Off-Equipment Man-Hours are as defined in para. 4-4b(2)(b)2.

(h) Built-In Test (BIT) Effectiveness.

1. Many new end items are being designed with built-in test capabilities to detect and isolate malfunctions to subsystems and/or line replaceable units (LRUs) within the end item. The purpose of BIT is to reduce the corrective maintenance time required to restore the end item to an operating condition. However, valuable maintenance manhours are expended if the BIT provides false indications. The two most common faults are that the BIT falsely indicates a malfunction, or indicates a malfunction in the wrong LRU. A measure of the adequacy of the BIT is to determine the success ratio for this equipment. Presently this data must be collected manually.

2. BIT Success Ratio (Percent).

$$\text{Success Ratio} = \frac{\text{Malfunctions Detected/Isolated}}{\text{Total Malfunctions Indicated}} \times 100$$

where:

Malfunctions Detected/Isolated are the sum of the successful attempts of the BIT to detect/isolate malfunctions over some specific time period.

Total Malfunctions Indicated are the sum of all malfunctions indicated by the BIT for the same time period.

3. Fault Detection Rate (Percent).

$$\text{Rate} = \frac{\text{Total Confirmed Failures Detected by BIT}}{\text{Total Corrective Maintenance Occurrences}} \times 100$$

where:

Total Corrective Maintenance Occurrences are the sum of the unit count for all on-equipment type 1 and type 2 how malfunctioned codes in combination with action taken codes A, F, G, K, L, P, R, V, and Z (see appendix 4-2A for definitions of action taken codes).

4. Fault Isolation Rate (Percent).

$$\text{Rate} = \frac{\text{Total Confirmed LRU Failures Detected by BIT}}{\text{Total Confirmed Failures Detected by BIT}} \times 100$$

5. False Alarm Rate (Percent).

$$\text{Rate} = \frac{\text{Total Units With No Defect Found}}{\text{Total Failures Indicated by BIT}} \times 100$$

where:

Total Units With No Defect Found are the sum of the unit count for all BIT-indicated failures with action taken code H, or a combination of action taken codes P and R with action taken code B.

6. There are other categorizations by which BIT effectiveness can be measured. The important thing is to have a system that is automatic (computer operated), and that will update itself appropriately when a suspected failed component bench-checks serviceable. In some cases, manual manipulation of data may be necessary, as when the bench check is being performed at a depot, contractor, or vendor facility. Whenever possible, these inputs should also be computer processed by the test team by requiring the repair facility to document the repair on AFTO form 349 or AFSC form 258-4. Using the breakdown below, and by setting aside one unused block on the 349 or 258/258-4, BIT success rate can be sorted against any series of other entries on these forms (WUC for example) and calculated accordingly.

a. BIT correctly detected and isolated a malfunction.

b. BIT detected trouble but did not isolate.

c. BIT detected correctly but isolated wrong LRU.

d. BIT failed to detect a trouble that existed.

e. BIT indicated a failure when none existed.

f. No BIT capability on system.

(i) Actuarial Life Expectancy.

The actuarial analysis program developed by the Air Force is a unique system correlating usage and failure data for analyzing equipment reliability, developing actuarial life expectance factors, and forecasting failures. To apply these techniques, there must be adequate data for the item being evaluated. During operational test and evaluation the two most likely items that may be considered for this type of analysis are selected high-value components, aircraft engines, and auxiliary power units. Since this is a complex analysis effort and considerable data are required to make the analysis meaningful, the techniques are not included in this document. However, the techniques for performing the computations are presented in TOs 00-25-128 and 00-25-217, and AFM 400-1, Volume III, Part Three. Normally, sufficient failure experience will not be realized during OT&E to render this type of analysis workable. However, application of compatible data collection and processing procedures should be considered.

(j) Discrepancies Per Scheduled Inspection Rate.

1. With the new systems being introduced into the inventory, the effectiveness of the inspection system must be evaluated to ensure that manhours are efficiently utilized and not used just for inspection's sake. This can be evaluated with respect to three major areas: preflight inspections, thruflight/postflight inspections, and phase/periodic/isochronal inspections.

2. Discrepancies Per Scheduled Inspection Rate (Preflight).

$$\text{Rate} = \frac{\text{Total Number of Discrepancies}}{\text{Total Number of Inspections}} \times 100$$

where:

Total Number of Discrepancies is the sum of the unit count for all discrepancies with when discovered code J during a given time period.

Total Number of Inspections is the sum of the unit count for all type maintenance code D actions combined with WUC Series 031XX for the same period.

3. Discrepancies Per Scheduled Inspection (Thruflight and Basic Postflight).

$$\text{Rate} = \frac{\text{Total Number of Discrepancies}}{\text{Total Number of Inspections}} \times 100$$

where:

Total Number of Discrepancies is the sum of the unit count for all discrepancies with when discovered code H for a given time period.

Total Number of Inspections is the sum of the unit count for all type maintenance code C actions combined with WUC Series 032XX for the same period.

4. Discrepancies Per Scheduled Inspection (Phase, etc.).

$$\text{Rate} = \frac{\text{Total Number of Discrepancies}}{\text{Total Number of Inspections}} \times 100$$

where:

Total Number of Discrepancies is the sum of the unit count for all discrepancies with when discovered codes K, M, 3, and 4 for a given time period.

Total Number of Inspections is the sum of the unit count for all type maintenance codes E, H, and P and WUCs of 033XX and 034XX for the same period.

(k) Percent Scheduled Inspection Man-Hours.

1. As with (j) above, this figure can be used as a measure of the efficiency of the inspection concept. If an excessive portion of man-hours is being expended on inspections and no major problems are being prevented, then further refinement of the inspection concept is required.

2. Percent Scheduled Inspection Man-Hours.

$$\text{Percent} = \frac{\text{Total Man-Hours Scheduled Maintenance}}{\text{Total Man-Hours}} \times 100$$

where:

Total Man-Hours Scheduled Maintenance is the sum of all man-hours expended against WUCs which apply to pre-thruflight or basic postflight and phase, plus all man-hours documented against when discovered codes H, J, K, M, 3, and 4 for a given time period.

Total Man-Hours is as defined in paragraph 4-4b(2)(a)1 for the same period.

c. Availability Parameters.

The formulas for developing the availability parameters listed in table 4-2e are presented in the following paragraphs. As previously indicated, these equations provide point estimates for each parameter. Statistical techniques are presented in subsection 4-4e.

(1) Criteria and Ground Rules.

The policies and procedures for status reporting of selected aerospace equipment are provided in AFR 65-110. This document is further amplified by AFMs 65-260, 65-265, 65-272, 65-662, and 65-663. The criteria of these manuals are applicable to availability evaluations. Operational

availability is based on a possessed time of 24 hours per day. Factors to be considered in evaluating the operational availability parameters include:

(a) No more than 0.1 hour will be allowed for minor corrective maintenance downtime during preflight and postflight inspection without calling the aerospace vehicle Not Operationally Ready (NOR). This criterion also applies to any aerospace vehicle otherwise operationally ready.

(b) If an item withdrawn from stock is considered interchangeable or a substitute for a failed item, the actual repair time will be used even though the preferred item may involve a different MTTR.

(c) All time to 0.1 hour will be used to report NORS time. All NORS time will be used to determine operationally ready (OR) rates. NORS time starts with verification that a replacement is not available and the reparable unit cannot be repaired locally. Time spent in verification will be reported as NORM time if the NOR criteria apply.

(d) Time spent on ECPs and TCTOs will be reported if the end item is rendered NOR thereby.

(e) Time spent investigating ground transmitting facilities (data bank, GCI, ILS, etc.) will be reported as NOR time if other NOR criteria apply to the aerospace vehicle condition being reported.

(f) Time spent researching manuals, TOs, etc., if directly related to a specific maintenance task shall be included in NOR time if other NOR criteria apply.

(g) Time to repair both primary (independent) failures and secondary (dependent) failures will cause the end item to be considered Not Operationally Ready.

(h) All time attributable to inadequate AGE or T.O. deficiencies shall be included in the repair (NOR) time.

(i) Time expended in preflight, thru flight, service, postflight, and configuring the aerospace vehicle (including ammunition and weapons loading) will not in itself cause the vehicle to be reported NOR, but all consequential corrective actions will, if other NOR criteria apply.

(j) Time expended while parts are removed from the end item for failure analysis is reported as NOR time if other NOR criteria apply.

(k) Time for repairs resulting from accidents, incidents, or foreign object damage shall be reported as NOR time if other NOR criteria apply.

(l) Time attributed to administrative and logistics delays and dead shift time shall be included in the NOR time if other NOR criteria apply.

(m) Maintenance or operator induced failures, for whatever reason, shall cause the end item to be reported NOR if the failure prevents the item from being able to accomplish all missions for which it is equipped.

(n) Noninstalled or inoperative subsystems will not affect end item status reporting if the equipment was not operational intentionally, was not caused by a failure, and does not cause an alteration to scheduled test/ operational events.

(o) To be operationally ready, the end item must be capable of performing all of its assigned missions (for which it is configured during testing).

(p) Failures of test instrumentation and associated wiring and hardware will not affect the reported status of the aerospace vehicle.

(q) Inflight reported discrepancies that affect OR status are considered to have occurred at postflight engine shutdown, and NOR time begins at that time.

(r) The following is a condition status summary of the reportable not operationally ready classifications in order of their reporting precedence (see AFR 65-110).

1. NORM-G Unscheduled

2. NORM-G Scheduled

3. NORS-G

4. NORM-F

5. NORS-F

(2) Equations.

(a) Operationally Ready (OR) Rate (aircraft, AGM-28, AGM-69A, and trainers).

$$\text{OR Rate} = \frac{\text{Operationally Ready Hours}}{\text{Hours Possessed}} \times 100$$

where:

Operationally Ready Hours are the sum of unscheduled NORM, scheduled NORM, and NORS hours, subtracted from the hours possessed for the time span of the evaluation.

Hours Possessed are the product of 24 hours per day and the number of days in the time span of the evaluation.

NOTE: These values hold for a single end item. For more than one end item under test OR rate is:

$$\text{OR Rate} = \frac{\text{Total Operationally Ready Hours}}{\text{Total Hours Possessed}} \times 100$$

where:

Total Operationally Ready Hours are the sum of the unscheduled NORM, scheduled NORM, and NORS hours for all end items under test, subtracted from the total hours possessed for the time span of the evaluation.

Total Hours Possessed are the product of the number of end items under test 24 hours per day and the total number of days in the time span of the evaluation.

(b) Aircraft Utilization (AU) Rate and Sortie Rate.

1. AU Rate =

$$\frac{\text{Number of Sorties Flown}}{(\text{Number of Maintenance Days})(\text{Number of Aircraft})}$$

where:

Number of Sorties Flown is the total number of sorties flown during the time span of the evaluation.

Number of Maintenance Days is the total number of workdays in the time span of the evaluation.

2. Daily Sortie Rate =

$$\frac{\text{Number of Sorties Flown}}{\text{Number of Flying Days}}$$

(c) Item On-Line (Uptime) Rate (CEM).

For the purposes of availability evaluation, item on-line (uptime) is synonymous with operationally ready hours. Their primary difference is that OR hours are usually associated with aerospace vehicles and trainer equipment, while on-line (uptime) is usually associated with ground CEM and certain other end items not classed as aerospace vehicles. The operational rate is calculated the same as the OR rate using on-line (uptime) hours as the numerator and hours possessed as the denominator.

$$\text{Operational Rate} = \frac{\text{On-Line (Uptime) Hours}}{\text{Hours Possessed}}$$

where:

On-Line (Uptime) Hours are calculated from total maintenance downtime, other downtime, and supply delay time, subtracted from the total possessed hours for the period as shown in command CEM equipment status report, PCN23115A, H-6000 PCN GGI1FODA, RCS: HAF-LGY(M)7152. For trainers/simulators, only T1 and T3 operating times are used to express trainer utilization. T9, power-on time, is not used to compute utilization rates. It should also be noted that all utilization time does not necessarily require power on. T1 is used to report initial qualification training for formal students, whereas T3 is used for familiarization and proficiency training. T9 is used to report all power-on time, whether for utilization, maintenance, and checkout, and generally is read from an ETI.

(d) Item Standby Time.

1. Item standby time is the fraction of the possessed time that an aerospace vehicle or end item is considered ready to be operated but has not been activated for operation. Items that fall into this category include, but are not limited to, AGE and CEM.

(e) Item Alert Time.

Item alert time is the fraction of the possessed time that an aerospace vehicle is in an operating condition and is ready to perform its specified mission when called upon to so do. This term may be applied to items other than aerospace vehicles if there is indeed an alert condition associated with equipment operations.

(f) Item Downtime.

1. Item downtime is the fraction of possessed time that an end item is not available to perform its mission because of necessary maintenance or supply actions. The sum of scheduled, unscheduled, and delay time associated with these actions comprise downtime. Downtime is applicable to all end items regardless of their operating characteristics. A downtime rate can be calculated using downtime as the numerator and hours possessed as the denominator.

$$\text{Downtime Rate} = \frac{\text{Downtime (Hours)}}{\text{Hours Possessed}}$$

This rate can also be expressed in terms of scheduled, unscheduled, and delay time by substituting in turn the hours for each of these elements in the numerator of the above equation.

2. For CEM, a downtime condition may be reported as Amber ("A") or Red ("R") depending on how the NOR (limited/inoperative) condition affected the primary mission of the unit. The primary mission is the designated basic mission assigned by a military service to its operational units using the equipment. This mission should be identified in a supplement to

AFM 65-265 and/or in the test plan. The Amber condition exists when the equipment is not OR but is still capable of providing some usable data. The Red condition exists when reported item is unable to perform its function. CEM downtime may be separately expressed as downtime Amber, or downtime Red and Amber. It should be noted that downtime codes apply to active, standby, and backup equipment or channels thereof. The assigned mission of standby or backup equipment is to be ready for immediate recall or changeover.

3. When more than one end item is under test, an average downtime for the total test inventory may be required. The average downtime rate is obtained by:

$$\text{Downtime Rate (Avg.)} = \frac{\text{Total Downtime (Hours)}}{\text{Total Hours Possessed}}$$

where:

Total Downtime is the sum of all downtime for all of the items under test for the time span of the evaluation.

Total Hours Possessed are the product of the number of end items under test, 24 hours per day, and the total number of days in the time span of the evaluation.

(g) Not Operationally Ready, Supply (NORS) Rate.

Not operationally ready, supply comprises two categories: grounded and flyable. NORS rates can be based on either all grounded or all grounded and flyable hours combined. The following formulas apply:

1. NORS-G Rate.

$$\text{NORS-G Rate} = \frac{\text{Total NORS-G Hours}}{\text{Aircraft Hours Possessed}}$$

where:

Total NORS-G Hours is the sum of all NORS-G hours for all the aircraft under test over the time span of the evaluation period.

Aircraft Hours Possessed is defined in para. 4-4c(2)(a).

2. Total NORS Rate.

$$\text{Total NORS Rate} = \frac{\text{Total NORS Hours}}{\text{Aircraft Hours Possessed}}$$

where:

Total NORS Hours is the sum of all NORS-G and NORS-F hours for all aircraft under test over the time span of the evaluation period.

3. For equipment other than aircraft, a NORS rate is calculated as follows:

$$\text{NORS Rate} = \frac{\text{NORS Hours}}{\text{Total Hours Possessed}}$$

where:

NORS Hours is the sum of all NORS hours for the test inventory over the time period of the evaluation.

Total Hours Possessed is defined in para. 4-4c(2)(f)2.

a. For CEM, computed downtime rates by cause and condition, and by type, model, and series, are provided by the Command CEM Equipment Status Summary, RCS:HAF-LGY(M)7152, PCN 23115A. Three major categories are listed: maintenance, supply, and other (see appendix 4-5C).

b. For trainers and simulators, RCS:HAF-DPP(M)7102, Command and Trainer Equipment Inventory, Utilization and Status Reports, or RCS:HAF-DPP(M&AR)7103, Worldwide Trainer Equipment Inventory Utilization and Status Reports, provide similar information

(h) Other Parameters.

MTBF and MTTR are included under availability because inherent availability is based on these parameters. NORM rates indicate the fraction of the time spent maintaining or awaiting maintenance of an equipment (delays included). The impact of MTBF and MTTR on operational availability, without delays included, stems from the fact that failures, repairs, and maintenance make an item unavailable for performing its intended mission.

d. Supportability Parameters.

Methods of calculating the quantitative supportability parameters listed in table 4-2g are provided below. Discussions concerning the qualitative parameters are delineated in section 4-6. Again, the equations for quantitative supportability parameters provide point estimates of these parameters. Statistical techniques are discussed in subsection 4-4e.

(1) Criteria and Ground Rules.

When evaluating the quantitative supportability parameters listed in table 4-2g, the following groundrules apply.

(a) Shop actions are the off-equipment actions related to each work unit code. The three categories applicable to shop actions are listed below, where:

1. Repair is a unit count of the off-equipment actions which have been assigned action taken codes A, F, G, K, L, or Z.

2. Condemned is a unit count of equipment actions which have been assigned action taken code 9.

3. NRTS is a unit count of off-equipment actions which have been assigned action taken codes 1 through 8.

(b) The appropriate NRTS code will be used whenever a component is not repaired on base by the joint test force, even if a repair capability is programmed.

(c) Components in awaiting parts (AWP) status that are shipped by the contractor before expiration of the authorized holding times listed in AFM 67-1, Volume II, Part One, Chapter 16, will be coded NRTS-8.

(d) Repair capability data will be based on expendability, recoverability, repairability category (ERRC), XD and XF coded items, and items without ERRC codes but with features where they could be expected to be coded XD or XF.

(e) When evaluating repair capability, components considered NRTS are those with action taken codes 2 through 6, as follows:

2 = Lack of equipment, tools, or facilities

3 = Lack of technical skills

4 = Lack of parts

5 = Shop backlog

6 = Lack of technical data.

(f) Items not authorized for repair (NRTS-1), excess (NRTS-7), directed to be shipped (NRTS-8), and condemned (NRTS-9) are considered neither as items repaired nor as NRTS items when performing repair capability computation. This practice is in agreement with TO 00-20-3 computational procedures.

(g) Repaired components are those returned to service at base level (normally by the joint test force), with the following action taken codes:

A - Bench checked and repaired

F - Repair

G - Repairs and/or replacement of minor parts, hardware, and soft goods

K - Calibrated - adjustment required

L - Adjust

Z - Corrosion repair.

(h) Bench check serviceable rates are based on those components where off-equipment bench check actions reveal that these components are serviceable (action taken code B and how malfunctioned code 799).

(i) Could not duplicate (CND) rates are based on reported in-flight malfunctions of components for which on-equipment actions reveal that no repairs are required (action taken codes H and J with when discovered codes A, B, C, D, E, G, N, P, and 2).

(j) An item removed for suspected failure counts as a demand if the work center that normally would be responsible for the in-shop test or repair, has no failure-confirming test capability.

(k) All removed components coded with action taken codes for repair (A, F, G, K, L, or Z), and not repairable this station (NRTS codes 1 through 9) are counted as demands. (Action taken code B is not included as a demand.)

(l) The criteria used for recording maintenance start and stop time shall also be applied to the recording of support equipment start and stop time for the assessment of AGE utilization rates.

(m) Both on- and off-equipment maintenance man-hours shall be accumulated for AGE that is being tested as support equipment. Man-hours shall be accumulated in accordance with the groundrules established for maintainability parameters; see subsection 4-4b(1).

(n) The quantitative parameters listed in table 4-2g are generally applicable to all types of end items. Two additional parameters specifically associated with jet engine supportability are also provided because of their importance during aircraft OT&E.

1. Jet Engine Intermediate Maintenance (JEIM) Pipeline Time is the accumulation of calendar time from the date an engine is removed until the date it is reported ready to install.

2. JEIM Return Rate is the percent of total engines removed for cause that are repaired at base level maintenance and returned to service.

(2) Equations.

(a) Repair Capability.

$$\text{Repair Capability} = \frac{\text{Units Repaired}}{\text{Units Repaired} + \left(\begin{array}{c}\text{Units with Action Taken} \\ \text{Codes 2, 3, 4, 5, and 6}\end{array}\right)}$$

where:

Units Repaired is the sum of all items repaired over the time span of the evaluation period.

Units with Action Taken Codes 2, 3, 4, 5, and 6 are the sum of all items with these off-equipment codes over the time span of the evaluation period.

(b) Reparable Repair Rate (Percent).

$$\text{Reparable Repair Rate} = \frac{\text{Units Repaired}}{\text{Units Repaired} + \left(\begin{array}{c}\text{Units with Action Taken}\\ \text{Codes 1 through 9}\end{array}\right)} \times 100$$

where:

Units with Action Taken Codes 1 through 9 are the sum of all items with these off-equipment codes over the time span of the evaluation period.

(c) Bench Check Serviceable Rate (Percent).

$$\text{Rate} = \frac{\text{Serviceable Units}}{(\text{Repaired Units}) + (\text{Serviceable Units})} \times 100$$

where:

Serviceable Units are the sum of all off-equipment action taken code B units for some specific time period (action taken codes A, F, G, K, L, V, Z).

Repaired Units are the sum of all equipments repaired and returned to an operating condition over the same period of time.

NOTE: NRTS actions are not included in the denominator of this calculation because limited test capabilities usually exist during OT&E, and NRTS actions increase significantly under these conditions.

(d) Could Not Duplicate (CND) Rate (Percent).

CND Rate (For Operator Reported Malfunctions) =

$$\frac{\text{On-Equipment Could Not Duplicate Actions}}{\text{Operator Reported On-Equipment Malfunctions}} \times 100$$

where:

On-Equipment Could Not Duplicate Actions are the sum of the unit count for action taken codes H and J in combination with when discovered codes A, B, C, D, E, G, N, P, and 2 over some specific time span.

Operator Reported On-Equipment Malfunctions are the sum of the unit count for action taken codes F, G, H, J, K, L, P, R, V, X, and Z in combination with when discovered codes A, B, C, D, E, G, N, P, and 2 over the same specific time span.

(e) Mean Time Between Demand (MTBD).

MTBD is applicable to aircraft and all other end items. The method of calculation is dependent upon how operating time is accumulated for the item under test. For aircraft, the time is expressed in flying hours; for other end items, it is expressed in operating hours.

1. MTBD Aircraft.

$$MTBD_{(A)} = \frac{\text{Total Demand Actions}}{\text{Flight Hours}}$$

where:

Total Demand Actions are the sum of the unit count for on-equipment action taken codes P and R in combination with all type 1 and 2 how malfunctioned codes, less action taken code B combined with how malfunctioned code 799 over some specific time span. Note: Time change, scheduled maintenance, and modification removals are not included.

Flight Hours is the accumulation of total flying hours over the same specific time span.

2. MTBD Other.

$$MTBD_{(O)} = \frac{\text{Total Demand Actions}}{\text{Operating Time}}$$

where:

Operating Time is the accumulation of actual hours that an item is in operation based upon ETI readings or historical documents (possessed time less down time) for some specific time period.

(f) AGE Utilization Rates.

$$\text{Rate} = \frac{\text{Total Operating Time per Month}}{\text{(Number of Like Pieces of AGE Possessed)}}$$

where:

Total Operating Time Per Month is the sum of the operating times accumulated for each like piece of AGE based on ETI readings or historical documents (equipment logs).

(g) Support Equipment Maintenance Man-Hours Per Operating Hour.

$$\text{Rate} = \frac{\text{On-Equipment Man-Hours}}{\text{Operating Time}}$$

where:

On-Equipment Man-Hours is the sum of on equipment labor expended for all support general work unit codes and all on-equipment labor expended on work unit codes requiring preventive and corrective maintenance actions for some specific time period.

Operating Time is defined in para. 4-4d(2)(e)2.

(h) PME No Defect Rate (Percent).

$$\text{Rate} = \frac{\text{No Defects}}{\text{Total PME Calibrated}} \times 100$$

where:

No Defects is the number of PME found to be defect-free during scheduled calibration accumulated for some specific time period.

Total PME Calibrated is the total number of PME processed for calibration over the same time period.

(i) Requisition Fill Rate (Percent).

$$\text{Rate} = \frac{\text{Requisitions Filled}}{\text{Total Requisitions}} \times 100$$

where:

Requisitions Filled is the sum of requisitions for components, modules, repair parts, consumables, etc., that are filled by base supply/contractor within prescribed time limits over some specific time span. Items withdrawn from an established bench stock are not included.

Total Requisitions is the sum of all requisitions presented to base supply/contractor over the same specific time period.

(j) Cannibalizations Per Sorties Flown.

$$\text{Rate} = \frac{\text{Cannibalization Actions}}{\text{Sorties Flown}}$$

where:

Cannibalization Actions is the sum of all on-equipment action taken codes T accumulated over some specific time period.

Sorties is the total number of sorties flown over the same time period.

(k) Jet Engine Supportability Parameters.

1. JEIM pipeline time provides an assessment of engine turnaround time at the base level maintenance facility. The various types of actions that can be expected include but are not limited to:

a. Removed

b. Awaiting Maintenance

c. In Work

d. Engine Not Operationally Ready-Supply (ENORS)

e. Serviceable - Raw

f. Serviceable – Built-up

This information is used to determine spares requirements, and evaluate the engine maintenance concept and supportability with respect to sustaining an operationally ready rate. In combination with scheduled and unscheduled removal rates, in-work calendar days can be useful for evaluating JEIM crew, support equipment, and facility requirements.

2. JEIM Return Rate (Percent).

$$\text{Rate} = \frac{\text{Number Returned to Service at Base Level}}{(\text{Total Removals}) - (\text{Scheduled Removals} + \text{Directed Removals})} \times 100$$

where:

Number Returned to Service is the sum of all engines returned to service from base level maintenance over some specific time period.

Total Removals is the sum of all engines removed over the same time period.

Scheduled Removals is the sum of all engine removals on a scheduled basis over the same time period.

Directed Removals is the sum of all directed engine removals over the same time period.

e. Statistical Techniques.

This subsection presents a brief discussion on some basic statistical parameters associated with data reduction and analysis. Topics covered include the arithmetic mean, variance, standard deviation, and confidence intervals.

(1) Mean.

The arithmetic mean is one of the most widely used values in performing statistical analyses. This mean is only accurate as an indicator of the central location of data, when the data are in units of some uniform scale such as time, cycles, events, etc. The mean for n samples taken from some population of items is denoted as $\overline{X}$. The general equation for estimating the mean is:

$$\overline{X} = \sum_{i=1}^{n} \frac{X_i}{n} \tag{a}$$

where:

n in the number of observations in the summation, and X_i is the value of the i^{th} sample.

(2) Variance.

One index of variation that is used to denote the dispersion of individual observations about their mean value is variance. The equation for the sample variance, S_x^2, of n items is:

$$S_x^2 = \sum_{i=1}^{n} \frac{(X_i - \overline{X})^2}{n-1} \tag{b}$$

It has been proven mathematically that division of the sum of the squares by "n-1" provides an unbiased estimate of the population variance.

(3) Standard Deviation.

(a) The standard deviation is another index of variation and is expressed in the same units as the original data. The standard deviation is the square root of the variance. The equation for estimating the standard deviation is

$$S_x = \sqrt{\sum_{i=1}^{n} \frac{(X_i - \overline{X})^2}{n - 1}} \qquad (c)$$

$$S_x = \sqrt{S_x^2} \qquad (d)$$

(4) Central Limit Theorem.

Numerous distributions of populations have been identified and their properties mathematically described. Of particular significance is the normal distribution, sometimes called the Gaussian distribution, which is depicted by a symmetrical bell shaped curve. This distribution is important because the sample means from many types of distributions tend toward being distributed normally under certain very broad conditions. This is referred to as the "Central Limit Theorem". Thus, if a population has mean, μ*, and variance σ^2 then, using the Central Limit Theorem, the sample mean is normally distributed with mean μ and variance σ^2/n.

(5) Confidence Intervals.

It was previously indicated how certain population parameters are estimated. These are known as point estimates. On occassion, an interval estimate may be of more interest than a point estimate. Typically, an interval estimate is composed of a specified interval and the probability that that interval includes the true parameter value. This probability is often referred to as confidence and hence the name, "confidence interval".

(a) For example, assume that it is desired to determine an interval which has a pre-determined chance of bounding the true mean of a population whose mean, μ, is unknown and whose variance, σ^2, is known. By appeal to the Central Limit Theorem, we can say the sample mean is from a normal population with mean μ and variance σ^2/n. Further, using a normal distribution table (see reference (7)(b), page 4-100) a confidence interval can be formed, i.e.,

$$100\,(1-\alpha)\%\ \text{confidence interval for}\ \mu = \overline{X} \pm \left[z_{\left(1 - \frac{\alpha}{2}\right)} \right] \left[\frac{\sigma_x}{\sqrt{n}} \right] \qquad (e)$$

*In statistics true values are usually designated by using Greek letters and estimates are designated by the use of Roman letters.

where

α is a probability

$z_{(1 - \alpha/2)}$ is a number taken from established tables of the normal distribution.

(b) Explicitly, assume that equations (a), (b), (c), and (d) have provided the following results: From 15 observations, the mean man-hours per flying hour (MH/FH) are 37.8, and the original population variance is known to be 15.71. What is the 90% confidence interval for the mean MH/FH?

Then for equation (e),

$$\alpha = 0.10 \qquad (1 - 0.90)$$

$$\overline{X} = 37.8$$

$$z_{(1 - \alpha/2)} = z_{0.95} = 1.645$$

Thus, the 90% confidence interval for μ is $37.8 \pm 1.645 \dfrac{\sqrt{15.71}}{\sqrt{15}}$ which reduces to the interval (36.12, 39.48).

(6) Student's t-Distribution.

In most cases, however, the true variance is not known and hence a different distribution, called the t-distribution or Student's t-distribution, is used. The t-distribution is really a set of distributions since the sample size, n, appears in its mathematical description; thus a different distribution for each sample size. In this case the

$$100\,(1 - \alpha)\%\ \text{confidence interval for}\ \mu = \overline{X} \pm \left[t_{(1 - \frac{\alpha}{2}\,;\,n-1)}\right]\left[\frac{S_x}{\sqrt{n}}\right] \qquad \text{(f)}$$

where:

$t_{(1 - \alpha/2\,;\,n-1)}$ is the Student's t value from the distribution with (n-1) degrees of freedom.

Thus, in the previous example let the calculated variance be 15.71. Then by noting the t-value as 1.761 from reference (7)(b) (page 4-100),

$$100\,(1-\alpha)\%\ \text{confidence interval for}\ \mu = 37.8 \pm 1.761\frac{\sqrt{15.71}}{\sqrt{15}} = (36.00,\ 39.60)$$

(7) References.

There are additional statistical techniques available for developing confidence intervals for various distributions. Information concerning these techniques can be found in the following textbooks:

(a) A. Hald, Statistical Theory with Engineering Applications - John Wiley and Sons, Inc., New York, N.Y. - 1960

(b) A. Hald, Statistical Tables and Formulas - John Wiley and Sons, Inc., New York, N.Y. - 1960

(c) N. Mann, R. Schafer, N. Singpurwalla, Methods for Statistical Analysis of Reliability and Life Data - John Wiley and Sons, New York, N.Y. - 1974

(d) R. Spiegal, Theory and Problems of Statistics - Schaum Publishing Co., New York, N.Y. - 1961

(e) A. W. Wortham and T.E. Smith, Practical Statistics in Experimental Design - Dallas Publishing House, Dallas, Texas - 1959

(f) R. Langley, Practical Statistics Simply Explained - Dover Publications, Inc., New York, N.Y. - 1971

(g) D.B. Owen, Handbook of Statistical Tables - Addison-Wesley Publishing Company, Inc., Reading, Mass - 1962

(h) J.W. Pratt, H. Raiffa and R. Schlaifer, Introduction to Statistical Design Theory - McGraw Hill Book Company, New York, N.Y. - 1965.

f. Quality of Data.

This subsection discusses the need for data quality, describes contributors and sources of error, and identifies ways of influencing the quality of data collected. The accuracy of logistics assessments, and the decisions based thereon, depend on both the quantity and quality of data collected. The quantity of data compiled in support of a specific test objective or subobjective affects the statistical confidence value assignable to the data. Similarly, the quality of the data collected also influences the degree of confidence associated with the results of the data collection process. The data gathered and processed during OT&E must be credible.

(1) The Maintenance Data Collection System has not enjoyed a reputation for data accuracy. Results of an inspection of the USAF Maintenance Data System, 22 September-29 December 1969 by The Inspector General ("Report of Audit 4314-4, 456 Bombardment Wing, Maintenance Data Collection System – Production Records and Reports" Beale AFB CA, 17 August 1973); and a HQ SAC, Aircraft Engineering Division Report (No. P-238, "Maintenance Data Collection Errors", 27 November 1974), highlighted the problems and illuminated causes thereof.

(a) For those concerned with the quality of OT&E data, the November 1974 SAC study is most useful. The results of that study revealed:

1. Twenty-six percent of AFTO form 349 entries were incorrect.

2. Of the errors found, 18 percent were due to lack of corresponding action taken codes P (removed) and Q (installed), i.e., a component was reported as removed but there was no corresponding subsequent installation action reported (or vice versa).

3. Of the errors found, 9 percent were attributed to a similar lack of correspondence between action taken codes T and U for cannibalizations.

4. Twenty-four percent of the errors were due to unmatched on and off-equipment actions. Reported off-equipment activity could not be traced to a requisite, preceding on-equipment event, and vice versa.

5. Some of the errors were detected by the base-level computer error edit. Sixty-six percent of the computer detected errors were created during keypunching. During the study of November 1974, the computer edit routines detected only 8 percent of the actual documentation errors. The edit routines have since been revised and it is likely that routines existing today would identify a larger portion of errors. It should be emphasized, however, that once data is accepted by the B3500, it cannot be changed. Some organizations are supported by command-unique data systems which use data stripped from the MDCS tapes. If corrections or adjustments are made to the command-unique MDCS data, the results produced will be disparate with the MDCS data bank and the AFLC DO56 data derived thereform. This disparity weakens the credibility of OT&E logistics assessments. Attention, therefore, should be focused on that phase of data collection and processing which precedes the data automation activity.

6. In the SAC study, the AFTO form 349 entries having significant error rates were found to be:

a. Work unit code - 29.7 percent of the total errors

b. How malfunction code - 28.2 percent of the total errors

c. Action taken code - 20.6 percent of the total errors

d. Other entries contributed to the error rate to a lesser degree (when discovered code, 8.0 percent; units complete, 6.1 percent; type maintenance code, 3.8 percent).

7. The investigation revealed certain conditions believed to have contributed to errors. These were:

a. Forms were not filled out as work was performed, but at the end of the work shift.

b. Emphasis was on selecting codes or combinations of codes known to be acceptable by the B3500 edit routines.

c. There was a lack of understanding of how to document certain actions.

d. Included in -06 code manuals are different work unit codes for the same type component. The -06 code manual in one case applied to an aircraft configured with either of two different engines (J57 and TF33). Also, different WUCs are used for similar components associated with the two different engines.

8. Work centers generating large volumes of AFTO forms 349 generally had the highest error rate. During one OT&E program, the test force reported approximately 40 percent of the data were either erroneous or missing.

(2) Actions that can be taken to improve the quality of OT&E data include:

(a) Indoctrination of data collectors, with emphasis placed on the need for credibility dictated by the use of the data at Program Acquisition Reviews, Secretarial Program Reviews, Defense System Acquisition Review Council presentations, and briefings to the Air Staff and Major Command commanders and their staff. Processed data are also subject to use by Congress and the General Accounting Office (GAO). Independence, objectivity, and credibility are very tenuous attributes that are difficult to acquire and easily lost.

(b) Training of personnel involved in completing forms. Emphasis should be placed on areas identifed as weak by the SAC study.

(c) Provision of selected personnel with copies of the B3500 error edit routine to facilitate correction of data rejected by the B3500. A copy of a recent B3500 error edit is included in appendix 4-4A.

(d) Establishment of a data review function. Versions of this activity have involved:

1. Use of an 80-80 listing produced from the key punched cards.

2. Weekly publication and distribution of error rates by work center and type error.

3. Use of the base level inquiry (or equivalent) system to evaluate matches between action taken codes P and Q, and between T and U, and between on-equipment and requisite off-equipment actions.

4. Comparison of the quantity of flight logged discrepancies with the quantity of corresponding on-equipment repair actions. (This is useful for monitoring the adequacy and timeliness of contractor reported data.)

(3) The preceding information should be reviewed and appropriate action taken early in the test program and, in some cases, before OT&E begins. Early emphasis on quality of data will minimize the difficulty of identifying and resolving problems later in the test program.

4-5. DATA SYSTEMS.

This section is divided into two subsections: Data System Summary (section 4-5a) and Data System Description (section 4-5b). Subsection 4-5a presents tables serving as a ready reference to definitions and sources of data for the various elements of the logistics measure-of-effectiveness parameters; and discusses, as cautionary information for potential users of the Maintenanace Data Collection and Product Performance Systems, certain limitations and anomalies of these systems. Subsection 4-5b describes the output products of data systems applicable to logistics assessment.

a. <u>Data System Summary</u>.

(1) This subsection provides tabulated information relating the parameters of the logistics measure-of-effectiveness equations discussed in subsection 4-4 to the data system output reports where quantitative information on the parameters can be obtained.

(2) Table 4-5a lists the parameters used in obtaining the prime measures of effectiveness (i.e., reliability, maintainability, availability, supportability), references the paragraph of section 4-4 where the equations are discussed, and references specific items of table 4-5b, the data system source listing.

(3) Table 4-5b lists 31 variables (parameters and/or data elements), the data systems and specific report number where data on these variables can be obtained, the source document of the data, and a reference to appendixes of this document wherein detailed descriptions of the data system output reports and report samples can be found.

(4) Table 4-5c consists of matrices of data system products versus data elements, parameters, and variables. These matrices provide summaries of the specific information available from the output reports discussed in subsection 4-5b, and the respective appendixes. They can be used in narrowing the search for specific output reports relative to selected variables.

(5) Two of the primary data systems applicable to logistics assessment are the Maintenance Data Collection System and the Product Performance System. Limitations of these systems are discussed in paragraph 4-5a(6) and (7).

(6) Characteristics of Maintenance Data Collection (MDC) System and Product Performance System (DO56), and limitations on their applications.

(Text continued on page 4-175.)

TABLE 4-5a. INDEX OF MEASURES OF EFFECTIVENESS PARAMETERS (Sheet 1 of 14)

Item	Parameter	Equation Elements/Variables	Ref. Item No., Table 4-5b	Ref. Para. No., Subsection 4-4
1.	Reliability		25	4-4a
	a. MTBF (aircraft)		15	4-4a(2)(a)
		1. Flight hours	10	4-4a(2)(a)1
		2. Use factor		4-4a(2)(a)1
		3. QPA	24	4-4a(2)(a)1
		4. Quantity of failure occurrences	9, 14d	4-4a(2)(a)1
		5. Special inventory	11	4-4a(2)(a)1
		6. Aircraft inventory	11	4-4a(2)(a)1
	b. MTBF (other than A/C)	1. Operating time	20	4-4a(2)(a)2
		2. (Variables 2 thru 5 above)		
		3. Test inventory	11	4-4a(2)(a)2
	c. Failure rates	1/MTBF; see above		4-4a(2)(b)
	d. Total maintenance actions/ 1000 FH		14	4-4a(2)(c)1
		1. Total quantity of maintenance actions	14	4-4a(2)(c)1
		2. Flight hours	10	4-4a(2)(a)1

TABLE 4-5a. (Sheet 2 of 14)

Item	Parameter	Equation Elements/Variables	Ref. Item No., Table 4-5b	Ref. Para. No., Subsection 4-4
1 (Cont)	e. Aborts/1000 FH			
	1) Before-flight aborts (rate)		1	4-4a(2)(d)1
		1. Aborts (WDC-A)	1	4-4a(2)(d)3
		2. Flight hours	10	4-4a(2)(a)1
		3. Special inventory	11	4-4a(2)(a)1
		4. Test inventory	11	4-4a(2)(a)2
	2) In-flight aborts (rate)		1	4-4a(2)(d)2
		1. Aborts (WDC-C)	1	4-4a(2)(d)3
		2. Variables 2 thru 4 above		
	(3) Total aborts/1000 sorties (rate)		1	4-4a(2)(e)
		1. Aborts (WDC A and C)	1	4-4a(2)(d)3
		2. Sorties	28	4-4a(2)(e)1
	(4) Abort rates	(Alternate method to above using MDCS WDC data)	1, 28	4-4a(2)(e)2

TABLE 4-5a. (Sheet 3 of 14)

Item	Parameter	Equation Elements/Variables	Ref. Item No., Table 4-5b	Ref. Para. No., Subsection 4-4
1 (Cont)	**f. Failure occurrences/1000 hr**			4-4a(2)(f)
		1. Quantity of failure occurrences	9, 14d	4-4a(1)(d)
		2. Operating time	20	4-4a(2)(f)
		3. Special inventory	11	4-4a(2)(a)1
		4. Test inventory	11	4-4a(2)(a)2
	g. Percent failures by when discovered code			4-4a(2)(g)
	(1) Before flight			4-4a(2)(g)1
		1. Failure occurrences for WDC A and B	14m	See app. 4-2A for WDC
		2. Failure occurrences	9, 14d	4-4a(1)(d)
	(2) In-flight			4-4a(2)(g)2
		1. Failure occurrences for WDC C and D	14m	See app. 4-2A for WDC
		2. Failure occurrences	9, 14d	4-4a(1)(d)
	(3) Between flights			4-4a(2)(g)3
		1. Failure occurrence for WDC E, F, G, H, J, N, V and 3	14m	See app. 4-2A for WDC
		2. Failure occurrences	9, 14d	4-4a(1)(d)

TABLE 4-5a. (Sheet 4 of 14)

Item	Parameter	Equation Elements/Variables	Ref. Item No., Table 4-5b	Ref. Para. No., Subsection 4-4
1 (Cont)	(4) During inspection			
		1. Failure occurrences for WDC K, M, P, Q, R, T, U, W, X, Z, 2 and 4	14m	See app. 4-2A for WDC
		2. Failure occurrences	9, 14d	4-4a(1)(d)
	h. Mission reliability	(See equations in para. 4-4a(2)(h) and items e(1), (2), and (3) above.)	25	4-4a(2)(h)
	(1) Mission reliability			4-4a(2)(h)1
	(2) Before flight reliability			4-4a(2)(h)2
	(3) In-flight reliability			4-4a(2)(h)3
	i. Corrosion summaries		5	
2	Maintainability			4-4b
	a. Man-hours/flight hours			4-4b(2)(a)1
	(1) On-equipment	1. On-equipment man-hours	12	4-4b(2)(a)1
		2. Flight hours	10	4-4b(2)(a)1
		3. Aircraft inventory	11	4-4a(2)(a)1
		4. Special inventory	11	4-4a(2)(a)1

TABLE 4-5a. (Sheet 5 of 14)

Item	Parameter	Equation Elements/Variables	Ref. Item No., Table 4-5b	Ref. Para. No., Subsection 4-4
2 (Cont)	(2) Off-equipment MH/FH (rate)			
		1. Off-equipment man-hours	12	4-4b(2)(a)2
		2. Variables 2, 3, 4, above		
	(3) Total MH/FH	On-equipment and off-equipment as above		4-4b(2)(a)3
	b. Man-hours/operating hours	Substitute operating for flt. hrs as above	20	4-4b(2)(b)
	(1) On-equipment			4-4b(2)(b)1
	(2) Off-equipment			4-4b(2)(b)2
	(3) Totals			4-4b(2)(b)3
	c. Mean man-hours to repair (MMTR)			4-4b(2)(c)
		1. Total corrective maintenance man-hours	12	4-4b(2)(c)
		2. Total corrective maintenance occurrences	9, 14d	4-4b(2)(c)
	d. Mean time between maintenance (MTBM)		16	4-4b(2)(d)
		1. Operating time	20	
		2. Use factor		4-4a(2)(a)2

TABLE 4-5a. (Sheet 6 of 14)

Item	Parameter	Equation Elements/Variables	Ref. Item No., Table 4-5b	Ref. Para. No., Subsection 4-4
2 (Cont)		3. QPA	24	4-4a(2)(a)2
		4. Quantity of maintenance	9, 14d	4-4b(2)(d)3
		5. Special inventory	11	4-4a(2)(a)2
		6. Test inventory	11	4-4a(2)(a)2
	e. Mean active down time (MADT)		17	4-4b(2)(e)
		1. Total active downtime hours	17	4-4b(2)(e)
		2. Test inventory possessed hours	11	4-4a(2)(a)2
	f. NORM			4-4b(2)(f)
	(1) NORM-G (rate)			4-4b(2)(f)1
		1. NORM-G hours	18	4-4b(2)(f)1
		2. Aircraft possessed hours	23	4-4b(2)(f)1
	(2) Total NORM (rate)			4-4b(2)(f)2
		1. Total NORM hours (NORM-G and NORM-F)	18	4-4b(2)(f)2
		2. Aircraft hours possessed	23	4-4b(2)(f)1
	(3) NORM (rate), other than A/C			4-4b(2)(f)3
		1. NORM hours	18	4-4b(2)(f)3
		2. Total hours possessed	23	4-4b(2)(f)3

TABLE 4-5a. (Sheet 7 of 14)

Item	Parameter	Equation Elements/Variables	Ref. Item No., Table 4-5b	Ref. Para. No., Subsection 4-4
2 (Cont)	g. NRTS (index)			4-4b(2)(g)
		1. Total NRTS man-hours for action taken codes 1 thru 9	19	4-4b(2)(g)
		2. Off-equipment man-hours	12	4-4b(2)(b)2
	h. Built-in test effectiveness			4-4b(2)(h)1
	(1) Bit success ratio	1. Malfunction detected/isolated	None	4-4b(2)(h)2
		2. Total malfunctions indicated	None	4-4b(2)(h)2
	(2) Fault detection			4-4b(2)(h)3
		1. Total confirmed failures detected by BIT	None	
		2. Total corrective maintenance (type 1 and 2 how mal in combination with action taken codes A, F, G, K, L, P, R, V, Z)	14	4-4b(2)(h)3
	(3) Fault isolation rate			4-4b(2)(h)4
		1. Total confirmed LRU failures detected by BIT	None	
		2. Total confirmed failures detected by BIT	None	

TABLE 4-5a. (Sheet 8 of 14)

Item	Parameter	Equation Elements/Variables	Ref. Item No., Table 4-5b	Ref. Para. No., Subsection 4-4
2 (Cont)	(3) Fault isolation rate			4-4b(2)(h)4
		1. Total confirmed LRU failures detected by BIT	None	
		2. Total confirmed failures detected by BIT	None	
	(4) False alarm rate			4-4b(2)(h)5
		1. Total units with no defects found (types 1 and 2 how mal in combination with action taken code B)	14	4-4b(2)(h)5
		2. Total failures indicated by BIT	None	
	i. Actuarial life expectancy	(Data for engines only)	8k	4-4b(2)(i)
	j. Discrepancies per scheduled inspection	1. Scheduled inspections	None	4-4b(2)(j)
		2. Discrepancies	None	
	k. Percent scheduled inspection man-hours	1. Total maintenance man-hours	None	4-4b(2)(k)
		2. Inspection man-hours	None	
3	Availability		3	4-4c
	a. Operational ready (OR) rate	1. Operationally ready hours	18	4-4c(2)(a)
		2. Hours possessed	23	4-4c(2)(a)

TABLE 4-5a. (Sheet 9 of 14)

Item	Parameter	Equation Elements/Variables	Ref. Item No., Table 4-5b	Ref. Para. No., Subsection 4-4
3 (Cont)	b. Aircraft utilization rate and sortie rate			4-4c(2)(b)
	(1) AU rate			4-4c(2)(b)1
		1. Number of sorties flown	28	4-4c(2)(b)1
		2. Number of maintenance days		4-4c(2)(b)1
		3. Number of aircraft		4-4c(2)(b)1
	(2) Sortie rate			4-4c(2)(b)2
		1. Number of sorties flown	28	4-4c(2)(b)2
		2. Number of flying days		4-4c(2)(b)2
	c. Item on-line up-time (ground CEM)			4-4c(2)(c)
	(1) OR rate			4-4c(2)(c)
		1. On-line (uptime) hours	18, 20	4-4c(2)(c)
		2. Hours possessed	23	4-4c(2)(a)

TABLE 4-5a. (Sheet 10 of 14)

Item	Parameter	Equation Elements/Variables	Ref. Item No., Table 4-5b	Ref. Para. No., Subsection 4-4
3 (Cont)	d. Item standby time		3	4-4c(2)(d)1
	e. Item alert time		3	4-4c(2)(e)
	f. Item downtime			4-4c(2)(e)
	(1) Downtime rate			4-4c(2)(e)
		1. Downtime (hours)	7, 14, 17b	4-4c(2)(f)1
		2. Hours possessed	23	4-4c(2)(a)2
	(2) Downtime rate (ave.)			
		1. Total downtime	7, 14, 17b	4-4c(2)(f)2
		2. Total hours possessed	23	4-4c(2)(f)2
	g. NORS		18	4-4c(2)(g)
	(1) NORS-G rate (aircraft)			4-4c(2)(g)1
		1. Total NORS-G hours	18	4-4c(2)(g)1
		2. Aircraft hours possessed	23	4-4c(2)(a)1
	(2) Total NORS rate (A/C)			4-4c(2)(g)2
		1. Total NORS hours	18	4-4c(2)(g)2
		2. Aircraft hours possessed	23	4-4c(2)(a)

TABLE 4-5a. (Sheet 11 of 14)

Item	Parameter	Equation Elements/Variables	Ref. Item No., Table 4-5b	Ref. Para. No., Subsection 4-4
3 (Cont)	(3) NORS rate (other than aircraft)			4-4c(2)(g)3
		1. NORS hours	18	4-4c(2)(g)3
		2. Total hours possessed	23	4-4c(2)(f)2
4	Supportability		29b, c	4-4d
	a. Repair capability			4-4d(2)(a)
		1. Units repaired	14c	4-4d(2)(a)
		2. Units with action taken codes 2, 3, 4, 5, 6	14b(3), 14c	See app. 4-2A for action taken codes
	b. Reparable repair rate			4-4d(2)(b)
		1. Units repaired	14c	See app. 4-2A for action taken codes
		2. Units with action taken codes 1-9	14b(3), 14c	
	c. Bench check serviceable rate	1. Serviceable units (off-equip. action taken code B)	14c(2)	See app. 4-2A for action taken codes
		2. Repaired units	14c(2)	4-4d(2)(c)

TABLE 4-5a. (Sheet 12 of 14)

Item	Parameter	Equation Elements/Variables	Ref. Item No., Table 4-5b	Ref. Para. No., Subsection 4-4
4 (Cont)	d. Could not duplicate rate (CND)			4-4d(2)(d)
		1. Total on-equip. actions with action taken codes F, G, H, J, K, L, P, R, V, X, Z, plus WD codes A-E, G, N, P, 2	14c, m	See app. 4-2A for action taken and WD codes
		2. On-equip. could not duplicate actions with action taken codes H and J, plus WD codes A-E, G, N, P, 2	14c, m	See app. 4-2A for action taken and WD codes
	e. *Mean time between demand* (MTBD)			4-4d(2)(e)
	(1) MTBD (aircraft)			4-4d(2)(e)1
		1. Total demand actions (on engines action taken codes P, R, plus types 1 and 2 how mal codes minus (action taken code B plus how mal 799)	14c	See app. 4-2A for action taken, how mal codes
		2. Flight hours	10	4-4d(2)(e)1
	(2) MTBD (other than aircraft)			
		1. Total demand time	14c	4-4d(2)(e)1
		2. Operating time	17, 20	4-4d(2)(e)2

TABLE 4-5a. (Sheet 13 of 14)

Item	Parameter	Equation Elements/Variables	Ref. Item No., Table 4-5b	Ref. Para. No., Subsection 4-4
4 (Cont)	f. AGE utilization rates		2	4-4d(2)(f)
		1. Total operating time per month	2	4-4d(2)(f)
		2. Number of like pieces of AGE possessed	11	4-4d(2)(f)
	g. Support equipment maintenance hours per operating hour			4-4d(2)(g)
		1. On-equipment man-hours	12	4-4d(2)(g)1
		2. Operating time	17, 20	4-4d(2)(g)1
	h. PME no defect rate			4-4d(2)(h)
		1. No defects	14j	4-4d(2)(h)
		2. Total PME calibrated	14j	4-4d(2)(h)
	i. Requisition fill rate		29b, c	4-4d(2)(i)
		1. Requisitions filled	29b, c	4-4d(2)(i)
		2. Total requisitions	29b, c	
	j. Cannibalizations per sortie flown			4-4d(2)(j)
		1. Cannibalization action	4	4-4d(2)(j)
		2. Sorties flown	28	4-4d(2)(j)

TABLE 4-5a. (Sheet 14 of 14)

Item	Parameter	Equation Elements/Variables	Ref. Item No., Table 4-5b	Ref. Para. No., Subsection 4-4
4 (Cont)	k. Jet engines supportability			
	(1) Pipeline time		8	4-4d(2)(k)1
	(2) JEIM return rate			4-4d(2)(k)2
		1. Number returned to service at base level	8	4-4d(2)(k)2
		2. Total removals	8	4-4d(2)(k)2
		3. Scheduled and directed removals	8	4-4d(2)(k)2
	l. Workload distribution	See also workload distribution histograms.	31	

TABLE 4-5b. APPLICABLE DATA SYSTEMS FOR LOGISTICS ASSESSMENT (Sheet 1 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
1	Aborts				
	a. Before-flight aborts (BFA)				
	(1) Force summary by MDS	IROS(KO51)	LOG-MM(Q)7372 KO51. YR1L (Part I)	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	(2) By WUC for prime ALC	IROS(KO51)	LOG-MM(Q)7216 KO51. YN4M	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	(3) By MDS and tail number	IROS(KO51)	LOG-MMO(Q)7216 KO51. YN6M	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	b. In-flight aborts (IFA)				
	(1) Force summary by MDS	IROS(KO51)	LOG-MM(Q)7372 KO51. YR1L (Part I)	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	(2) By WUC for prime ALC	IROS(KO51)	LOG-MMO(Q)7216 KO51. YN4M	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E

TABLE 4-5b. (Sheet 2 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
1 (Cont)	(3) By MDS and tail number	IROS(KO51)	LOG-MMO(Q)7216 KO51. YN6M	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	c. By on-equipment WUC, system, subsystem, and safety category	DO56	LOG-MMO(AR)7170 DO56B5006	AFTO Form 349	4-5D
	d. Aborts per 1000 flight hours by system, subsystem/WUC	DO56	LOG-MMO(AR)7220 DO56B5527	AFTO Form 349	4-5D
	e. By when disc. code for selected WUC	DO56	LOG-MMO(AR)7184 DO56B5023	AFTO Form 349	4-5D
	f. By when disc. code for selected FIIN	DO56	LOG-MMO(AR)7189 DO56C4403	AFTO Form 349	4-5D
	g. Daily by when disc. code, Eq. Cl, WUC	AFM 66-1 MDCS	SG001B321-322	AFTO Form 349	4-5A
	h. Monthly by when disc. code, Eq. Cl, WUC	AFM 66-1 MDCS	SG001B501-502	AFTO Form 349	4-5A
	i. Monthly by when disc. code for serially controlled and time change items	AFM 66-1 MDCS	SG001B506	AFTO Form 349	4-5A

TABLE 4-5b. (Sheet 3 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
1 (Cont)	j. Daily by when disc. code for serially controlled and time change items	AFM 66-1 MDCS	SG001B326	AFTO Form 349	4-5A
2	AGE Utilization by MDS				
	a. AGE operating time	MISEDS	AGE utilization report	AFSC Form 258	4-5I
	b. Total number of AGE uses	MISEDS	AGE utilization report	AFSC Form 258	4-5I
	c. Average operating time	MISEDS	AGE utilization report	AFSC Form 258	4-5I
	d. Operating time per 100 flight hours	MISEDS	AGE utilization report	AFSC Form 258	4-5I
3	Availability				
	a. Force summary by MDS alert availability	IROS(KO51)	LOG-MM(Q)7372 KO51. YR1L (Part I)	DO56 and GO33 Reports, AF Form 359, AFTO Form 349	4-5E
	b. Average aircraft available	IROS(KO51)	LOG-MM(Q)7372 KO51. YR1L (Part I)	DO56 and GO33 Reports, AF Form 359, AFTO Form 349	4-5E

TABLE 4-5b. (Sheet 4 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
4	Cannibalization Actions				
	a. Command summary by MDS (Provides unit and flying hr, on-equip.)	DO56	LOG-MM(Q)7510 DO56B6528	AFTO Form 349	4-5D
	b. By weapon system, base, ALC	DO56	LOG-MM(Q)7509 DO56B6529	AFTO Form 349	4-5D
5	Corrosion Summaries				
	a. By WUC for on- and off-equipment how mal codes 170 and 667 (provides units, man-hours, GPS, and cost data)	DO56	LOG-MMO(AR)7179 DO56B5016	AFTO Form 349	4-5D
	b. By system and subsystem	DO56	LOG-MMO(AR)7180 DO56B5017	AFTO Form 349	4-5D
6	Cost Data				
	a. Civilian Labor				
	(1) By workload breakdown structure (WBS) within MDS within PEC. (WBS includes: aircraft, air-frame, engine, accessories, ECOM, armament)	MCS (AFM 177-380)	HAF-ACF(M)7403 Report No. 1A	AFTO Form 349 (hours), Civilian Payroll System (Rates). (See also AFM 177-380 Chapter 4 for rates)	4-5B

TABLE 4-5b. (Sheet 5 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
6 (Cont)	(2) Non-MDS by WBS (non-MDS includes trainers, munitions, CEM, missiles, PME, AGE, other, and queen bee location costs)	MCS (AFM 177-380)	HAF-ACF(M)7403 Report No. 1B	AFTO Form 349 (hours), Civilian Payroll System (Rates). (See also AFM 177-380 Chapter 4 for rates.)	4-5B
	(3) By work accomplished code (WAC) within MDS within PEC (WAC includes programmed maintenance, activation/inactivation, modification, repair, inspection and test, other support, R&D)	MCS (AFM 177-380)	HAF-ACF(M)7403 Report No. 2A	AFTO Form 349 (hours) Civilian Payroll System (Rates). (See also AFM 177-380 Chapter 4 for rates.)	4-5B
	(4) Non-MDS by WAC	MCS (AFM 177-380	HAF-ACF(M)7403 Report No. 2B	AFTO Form 349 (hours) Civilian Payroll System (Rates). (See also AFM 177-380 Chapter 4 for rates.)	4-5B

TABLE 4-5b. (Sheet 6 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
6 (Cont)	(5) By customer (includes: AFCS, AFSC, ATC, MAC, TAC, SAC)	MCS (AFM 177-380	HAF-ACF(M)7403 Report No. 6	AFTO Form 349 (hours) Civilian Payroll System (Rates). (See also AFM 177-380 Chapter 4 for rates.)	4-5B
	(6) For indirect productive labor (includes: supervision, training, detail, leave, comp taken, alert, misc.)	MCS (AFM 177-380)	HAF-ACF(M)7403 Report No. 3	MMICS ETA Subsystem	4-5B
	(7) For indirect non-productive category, MDS within PEC (includes: rents, TDY, construction services, other)	MCS (AFM 177-380)	HAF-ACF(M)7403 Report No. 4	MMICS ETA Subsystem Civilian Payroll System (Rates)	4-5B
	b. Military labor (see 6a above, (1) through (5))				4-5B
	c. Material (funded) (see 6a above, (1) through (5))				4-5B
	d. Material (unfunded) (see 6a above, (1) through (5))				4-5B

TABLE 4-5b. (Sheet 7 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
6 (Cont)	e. Contractor maintenance (see 6a above, (1) through (5))				4-5B
	f. Indirect productive (see 6a above, (1) through (7))				4-5B
	g. By material category, MDS within PEC (includes: bench stock (non-MDS), COPARS/ COCESS, other local purchase, AVGAS (non-fly), direct material (funded) GFM (funded)	MCS (AFM 177-380)	HAF-ACF(M)7403 Report No. 5	General Accounting System Extract Tape (ABQMOA)	4-5B
	h. Cost data by MDS/WUC				
	(1) Average monthly LSC by WUC (5th digit)	IROS(KO51)	LOG-MMO(Q)7213 KO51.PW5L	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	(2) Force LSC per month for WUC by MDS	IROS(KO51)	LOG-MMO(Q)7213 KO51. PN1L/PN3L	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	(3) Cost breakdown by WUC/ MDS for field maintenance, special repairs, pack/ship, condemnation, base material	IROS(KO51)	LOG-MMO(Q)7213 KO51.PN4L	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E

TABLE 4-5b. (Sheet 8 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
6 (Cont)	(4) By MDS per month. Includes cost per operating hour, breakdown by A/C, TCTO, and 2nd digit WUC.	IROS(KO51)	LOG-MMO(Q)7213 KO51.PW4L	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	(5) High cost WUC ranking (force summary)	IROS(KO51)	LOG-MMO(Q)7213 KO51.PW3L	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	(6) NSN cost ranking by MDS, WUC	IROS(KO51)	LOG-MMO(Q)7213 KO51.PN6L	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	(7) NSN cost ranking by MDS, WUC for item manager	IROS(KO51)	LOG-MMO(Q)7213 KO51.PW2L	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	i. Base Maintenance Cost System Transaction	SBSS	D31/983	AF Form 2005	4-5G
7	Delay Time (CEM Equipment)				
	a. Supply delay time (BSS, depot, DSA, other)				
	(1) TMS 12-month summary	AFR 65-110 GO33	23165A	AF Form 2445	4-5C Section b

TABLE 4-5b. (Sheet 9 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
7 (Cont)	(2) By TMS, condition	AFR 65-110 GO33	HAF-LGY(M)7152 23115A/GGI1F0DA	AF Form 2445	4-5C Section b
	(3) By TMS, WUC	AFR 65-110 GO33	23125A/GGI5F0CA	AF Form 2445	4-5C Section b
	b. Delay hours by TMS, WUC	AFR 65-110 GO33	2315A/GGI5F0CA	AF Form 2445	4-5C Section b
	c. Open incident start delay time	AFR 65-110 GO33	23110A/GGA6F0DA	AF Form 2445	4-5C Section b
8	Engine Analysis				
	a. Engine remove and replace				
	(1) Daily by equipment classification, ID number (gives engine time)	AFM 66-1 MDCS	SG001B327	AFTO Form 349	4-5A
	(2) Monthly by equipment classification, ID number (gives engine time)	AFM 66-1 MDCS	SG001B507	AFTO Form 349	4-5A
	b. ENORS				
	(1) By cmd., family group, station number	DO24	DO24BE1W	AF Form 1534	4-5F
	(2) By cmd. (summary), type engine	DO24	DO24BBE2W	AF Form 1534	4-5F

TABLE 4-5b. (Sheet 10 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
8 (Cont)	(3) By station name (possessor) and family group	DO24	LOG-MMP(W)7212 DO24BBJ1W	AF Form 1534	4-5F
	(4) By engine type	DO24	DO24BBN1W	AF Form 1534	4-5F
	(5) By serial number	DO24	DO24BBR1W	AF Form 1534	4-5F
	c. Operating time by serial number	DO24	LOG-MMP(Q)7101 DO24AEH1A	AF Form 1534	4-5F
	d. Reparable time by engine designation, serial number	DO24	LOG-MMP(M)7220 DO24BCD1M	AF Form 1534	4-5F
	e. Foreign object damage by station number, end item	DO24	LOG-MMP(M)7224 DO24BGU1M	AF Form 1534	4-5F
	f. Overhaul and base maintenance completions by engine designation	DO24	DO24BJG2M	AF Form 1534	4-5F
	g. Spare engine assets by family group, station, possessing command	DO24	LOG-MMP(W)7204 DO24CDC3W	AF Form 1534	4-5F
	h. Resupply time by family group, base and major command	DO24	LOG-MMP(M)7203 DO24CHS1M	AF Form 1534	4-5F

TABLE 4-5b. (Sheet 11 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendi
8 (Cont)	i. Pipeline segment analysis by family, station and command	DO24	LOG-MMP(Q)7237 DO24DAE1Q	AF Form 1534	4-5F
	j. Installed engine/operating hours, by engine/aircraft designation	DO24	LOG-MMX(Q)7110 DO24FIO21	AF Form 1534	4-5F
	k. Failure rate data/actuarial data				
	(1) Official failure rates	DO24	DO24FIO22	AF Form 1534	4-5F
	(2) Failure rate, removal/loss reason	DO24	LOG-MMX(Q)7110/11 DO24FIO21/31	AF Form 1534	4-5F
	(3) Actuarial data by command (combined failure rate products)	DO24	LOG-MMX(Q)7120 DO24FNO22	AF Form 1534	4-5F
	(4) Overhaul failure rate products	DO24	LOG-MMX(Q)7121/22 DO24FRO11/41	AF Form 1534	4-5F
	(5) Field maintenance failure products	DO24	LOG-MMX(Q)7117/18 DO24FRO21/51	AF Form 1534	4-5F
	(6) Combined failure rate products	DO24	LOG-MMX(Q)7119 DO24FRO31	AF Form 1534	4-5F
	(7) Official USAF actuarial removal interval and life expectancy table	DO24	LOG-MMX(Q)7107 DO24KPO61	AF Form 1534	4-5F

TABLE 4-5b. (Sheet 12 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
8 (Cont)	l. Operating hours and failures by command (hours flown per failure)	DO24	LOG-MMX(Q)7112 DO24FNO23	AF Form 1534	4-5F
	m. Hours flown per failure by base	DO24	LOG-MMX(Q)7114 DO24FYO11	AF Form 1534	4-5F
	n. Inventory, distribution by AGE, by command	DO24	LOG-MMX(Q)7116 DO24FNO21	AF Form 1534	4-5F
	o. Forecasting engine removals	DO24	LOG-MMX(Q)7105 DO24KPO31	AF Form 1534	4-5F
	(1) Forecast, engine removals for major overhaul, field maintenance and both.	DO24		AF Form 1534	4-5F
	(2) By quarter	DO24	LOG-MMX(Q)7106 DO24KPO41	AF Form 1534	4-5F
9	Failure Data (See also Parts Replaced				
	a. Number of failures by TMS, WUC	AFR 65-110 GO33	23125A/GGI5F0CA	AF Form 2445	4-5C Section b
	b. High 25 on-equipment failures (monthly + previous 12 months) by equipment classification, item identity	AFM 66-1 MDCS	SG001B781	AFTO Form 349	4-5A

TABLE 4-5b. (Sheet 13 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
9 (Cont)	c. Number of actions by TMS	AFR 65-110 GO33	HAF-LGY(M)7152 23115A/GGI1F0DA	AF Form 2445	4-5C Section b
	d. Failure rates for selected WUC	DO56	LOG-MMO(AR)7184 DO56B5023	AFTO Form 349	4-5D
10	Flying Hours (See also Engine Analysis)				
	a. By organization station code, MDS, serial number (day-to-day)	AFR 65-110 GO33	N260010	AF Form 359, 359a, AF Form 781	4-5C Section a
	b. By organization station code, MDS, possession code, mission symbol/type (total hours and hours by mission type)	AFR 65-110 GO33	GGJBF0A	RCS:HAF-LGY(D) 7140 AF Forms 359, 359a, 781	4-5C Section a
	c. By MDS, serial number	AFR 65-110 GO33	GGJ7F0A	RCS:HAF-LGY(D) 7140 AF Forms 359, 359a, 781	4-5C Section a
	d. By MDS, assignment status code, mission symbol (total hours and hours by mission type)	AFR 65-110 GO33	GGJBF0B	RCS·HAF-LGY(D) 7140 AF Forms 359, 359a, 781	4-5C Section a

TABLE 4-5b. (Sheet 14 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
10 (Cont)	e. Force summary by MDS				
	(1) Support flight hours	IROS(KO51)	LOG-MM(Q)7372 KO51. YR1L (Part I)	DO56, GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	(2) Training flight hours	IROS(KO51)	LOG-MM(Q)7372 KO51. YR1L (Part I)	DO56, GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	(3) Operations flight hours	IROS(KO51)	LOG-MM(Q)7372 KO51. YR1L (Part I)	DO56, GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	(4) Total statistics	IROS(KO51)	LOG-MMO(Q)7213 KO51. PW4L	DO56, GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	f. By MDS and tail number	IROS(KO51)	KO51. YN6M	DO56, GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	g. CEM utilization (flight hours) by subsystem noun and tail number	MISEDS	Flying hour/sub-system report	AFFTC Form 300	4-5I

TABLE 4-5b. (Sheet 15 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
11	Inventory				
	a. Aircraft by MDS, serial number, organization	AFR 65-110 GO33	GGJ7F0A	RCS:HAF-LGY(D) 7140 AF Form 359	Section a 4-5C
	b. Organization station, MDS, serial number	AFR 65-110 GO33	GGJ7F0A	RCS:HAF-LGY(D) 7140 AF Form 359	Section a 4-5C
	c. CEM inventory				
	(1) By organization (on request)	AFR 65-110 GO33	265008	AF Form 2445	Section b 4-5C
	(2) By organization (monthly)	AFR 65-110 GO33	23145A/GGICF0EA	AF Form 2445	Section b 4-5C
	(3) By type/model/series (TMS)	AFR 65-110 GO33	23140A/GGIAF0DA	AF Form 2445	Section b 4-5C
	(4) TMS totals by sub-cmd	AFR 65-110 GO33	23146A/GGIEF0CA	AF Form 2445	Section b 4-5C
	d. Trainer equipment inventory	AFR 65-110 GO33	N272001	Prepunched AF Form 359	Section c 4-5C
	e. Force summary by MDS	IROS(KO51)	LOG-MMO(Q)7213 KO51.PW4	GO33 Report AF Form 359	4-5E

TABLE 4-5b. (Sheet 16 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
11 (Cont)	f. Inventory of end article for reported WUC maintenance action				
	(1) Computed inventory	DO56	LOG-MMO(AR)7170 DO56B5006	GO33 Report	4-5D
	(2) Special inventory	DO56	LOG-MMO(AR)7170 DO56B5006	B-4 Master Record (Manual)	
	g. Average aircraft possessed (force summary by MDS)	IROS(KO51)	LOG-MM(Q)7372 KO51.YR1L (Part I)	GO33 Report AF Form 359	
12	Labor Utilization/Man-Hours				
	a. To be developed	CAMMIS		*AFTO Form 349*	

TABLE 4-5b. (Sheet 17 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
12 (Cont)					
	b. **Labor hours, on-equipment**				
	(1) **For selected WUC within equipment type designator**				
	(a) By how mal code, action taken code, base and end article serial number	DO56	LOG-MMO(AR)7167 DO56B5503	AFTO Form 349	4-5D
	(b) Summary by how mal	DO56	LOG-MMO(AR)7167 DO56B5503	AFTO Form 349	4-5D
	(c) By action taken code	DO56	LOG-MMO(AR)7167 DO56B5503	AFTO Form 349	4-5D
	(2) Daily, by equipment classification, WUC	AFM 66-1 MDCS	SG001B321	AFTO Form 349	4-5A

TABLE 4-5b. (Sheet 18 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
12 (Cont)	(3) Monthly, by equipment classification, WUC	AFM 66-1 MDCS	SG001B501	AFTO Form 349	4-5A
	(4) By activity identifier, equipment class, and end item	AFM 66-1 MDCS	SG001B542	AFTO Form 349	4-5A
	(5) By performing work center, activity identifier equipment class, and end item	AFM 66-1 MDCS	SG001B541	AFTO Form 349	4-5A
	(6) Performance hi-lites (monthly) by equipment classification item identity, WUC	AFM 66-1 MDCS	SG001B771	AFTO Form 349	4-5A
	(7) High-25 man-hour consumers (current month and prior 12 months)	AFM 66-1 MDCS	SG001B791	AFTO Form 349	4-5A
	c. Labor hour (off-equipment)				
	(1) Daily by equipment classification, WUC	AFM 66-1 MDCS	SG001B322	AFTO Form 349	4-5A
	(2) Monthly by equipment classification, WUC	AFM 66-1 MDCS	SG001B542	AFTO Form 349	4-5A
	(3) By activity identifier, equipment classification and end item	AFM 66-1 MDCS	GS001B542	AFTO Form 349	4-5A

TABLE 4-5b. (Sheet 19 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
12 (Cont)	(4) By performing work center, activity identifier, equipment classification, and end item	AFM 66-1 MDCS	SG001B541	AFTO Form 349	4-5A
	(5) Performance hi-lites (monthly) by performing work center, FSC/Part No.	AFM 66-1 MDCS	SG001B772	AFTO Form 349	4-5A
	(6) High-25 man-hour consumers (current month and prior 12 months)	AFM 66-1 MDCS	SG001B791	AFTO Form 349	4-5A
	(7) Labor hours (off-equipment) in support of on-equipment action of DO56B5503	DO56	LOG-MMO(AR)7168 DO56B5504	AFTO Form 349	4-5D
	d. Direct labor				
	(1) By end item (on and off equipment)	AFM 66-1 MDCS	SG001B511	AFTO Form 349	4-5A
	(2) By performing work center (on and off equipment) by labor category	AFM 66-1 MDCS	SG001B525	AFTO Form 349	4-5A

TABLE 4-5b. (Sheet 20 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
12 (Cont)	e. Indirect labor				
	(1) Daily by performing work center and WUC	AFM 66-1 MDCS	SG001B324	AFTO Form 349	4-5A
	(2) Monthly by performing work center, WUC	AFM 66-1 MDCS	SG001B504	AFTO Form 349	4-5A
	(3) By performing work center, WUC and labor category	AFM 66-1 MDCS	SG001B535	AFTO Form 349	4-5A
	(4) By action identifier, performing work center, WUC, category of labor	AFM 66-1 MDCS	SG001B536	AFTO Form 349	4-5A
	f. Support general				
	(1) Daily by equipment classification, WUC and performing work center	AFM 66-1 MDCS	SG001B323	AFTO Form 349	4-5A
	(2) Monthly by equipment classification, WUC and performing work center	AFM 66-1 MDCS	SG001B503	AFTO Form 349	4-5A
	g. Productive man-hours				
	(1) By hour of day (histogram)	AFM 66-1 MDCS	SG001B813	AFTO Form 349	4-5A
	(2) By day of month (histogram)	AFM 66-1 MDCS	SG001B814	AFTO Form 349	4-5A

TABLE 4-5b. (Sheet 21 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
12 (Cont)	(3) By hour of day (workload saturation)	AFM 66-1 MDCS	SG001B815	AFTO Form 349	4-5A
	(4) By day of month (workload saturation)	AFM 66-1 MDCS	SG001B816	AFTO Form 349	4-5A
	h. Maintenance man-hours by MDS and tail number	IROS(KO51)	LOG-MMO(Q)7216 KO51.YN6M	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	i. Scheduled hours by WUC for prime ALC	IROS(KO51)	LOG-MMO(Q)7216 KO51.YN4M	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	j. Unscheduled hours by WUC for prime ALC	IROS(KO51)	LOG-MMO(Q)7216 KO51.YN4M	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	k. By MDS in ALC for WUC repair	IROS(KO51)	LOG-MMO(Q)7215 KO51.PN7L	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E

TABLE 4-5b. (Sheet 22 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
12 (Cont)	l. Man-hours by AFSC and WUC				
	(1) Total man-hours	MISEDS	PSTE report	AFSC Form 258	4-5I
	(2) Mean man-hours	MISEDS	PSTE report	AFSC Form 258	4-5I
	(3) Man-hours per flying hour	MISEDS	PSTE report	AFSC Form 258	4-5I
	m. Predictions by AFSC	MISEDS	PSTE report	AFSC Form 258	4-5I
	n. Man-hours by WUC (5th digit)				
	(1) Active hours (total tasks)	MISEDS	AMTS report	AFSC Form 258	4-5I
	(2) Man-hours (active hours x number of men)	MISEDS	AMTS report	AFSC Form 258	4-5I
	(3) Active hours per task	MISEDS	AMTS report	AFSC Form 258	4-5I
	(4) Man-hours per task	MISEDS	AMTS report, component discrepancy report	AFSC Form 258	4-5I
	(5) Active hours per flight	MISEDS	AMTS report	AFSC Form 258	4-5I
	(6) Man-hours per flight hour	MISEDS	AMTS report	AFSC Form 258	4-5I
	o. Man-hours by WUC (2nd digit)				
	(1) Line	MISEDS	MH/FH report	AFSC Form 258	4-5I
	(2) Shop	MISEDS	MH/FH report	AFSC Form 258	4-5I
	(3) Line + shop totals	MISEDS	MH/FH report	AFSC Form 258	4-5I

TABLE 4-5b. (Sheet 23 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
12 (Cont)	p. Man-hours by maintenance event (JCN)				
	(1) Active hours	MISEDS	258 edit program and maintenance event report	AFSC Form 258	4-5I
	(2) Man-hours	MISEDS	258 edit program and maintenance event report	AFSC Form 258	4-5I
	(3) Elapsed hours	MISEDS	258 edit program and maintenance event report	AFSC Form 258	4-5I
	(4) Line + shop hours	MISEDS	258 edit program	AFSC Form 258	4-5I
	q. Man-hours by WUC (5th digit), system, subsystem and safety category	DO56	LOG-MMO(AR)7170 DO56B5006	AFTO Form 349	4-5D
	(1) Scheduled man-hours	DO56	LOG-MMO(AR)7170 DO56B5006	AFTO Form 349	4-5D
	(2) Unscheduled man-hours	DO56	LOG-MMO(AR)7170 DO56B5006	AFTO Form 349	4-5D
	(3) Shop	DO56	LOG-MMO(AR)7170 DO56B5006	AFTO Form 349	4-5D

TABLE 4-5b. (Sheet 24 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
12 (Cont)	r. Man-hours per flying hour by weapon, command, and system (provides quarterly MH/FH and 12 month summary)	DO56	LOG-MMO(AR)7185 DO56B5025	AFTO Form 349	4-5D
	s. Maintenance man-hours per flying hour by system, subsystem, or WUC (A/C only)	DO56	LOG-MMO(AR)7220 DO56B5527	AFTO Form 349	4-5D
13	Landings				
	a. By organization status code, MDS, serial number	AFR 65-110 GO33	N260010	AF Form 359, AF Form 781	Section a
	b. Force summary by MDS	IROS(KO51)	LOG-MMO(Q)7213 KO51.PW4L	GO33 Report AF Form 359, 781	4-5E
14	Maintenance Actions				
	a. Number of CEM actions by TMS	AFR 65-110 GO33	HAF-LGY(M)7152 23115A/GGI1F0DA	AF Form 2445	Section b
	b. Maintenance action summaries				
	(1) On-equipment by MDS, ALC, WUC (includes repairs, removals to shop)	IROS(KO51)	LOG-MMO(Q)7215 KO51.PN7L	DO56, GO33 Reports, AFTO Form 349, AF Form 359	4-5E

TABLE 4-5b. (Sheet 25 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
14 (Cont)	(2) Off-equipment by MDS, ALC, WUC (provides NRTS, condemned, no defect)	IROS(KO51)	LOG-MMO(Q)7215 KO51.PN7L	DO56, GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	(3) Action taken code summary				
	(a) By 5th and 2nd WUC digit	MISEDS	Action taken report	AFSC Form 258	4-5I
	(b) By subsystem noun	MISEDS	Subsystem inflight discrepancy report	AFFTC Form 300	4-5I
	c. Units completed				
	(1) On-equipment for selected WUC within equipment type designator				
	(a) By how mal code, when disc. code, action taken code, base and end article serial no.	DO56	LOG-MMO(AR)7167 DO56B5503	AFTO Form 349	4-5D
	(b) Summary by how mal	DO56	LOG-MMO(AR)7167 DO56B5503	AFTO Form 349	4-5D
	(c) By action taken code	DO56	LOG-MMO(AR)7167 DO56B5503	AFTO Form 349	4-5D
	(2) Off-equipment (in support of on-equipment actions of DO56B5503)	DO56	LOG-MMO(AR)7168 DO56B5504	AFTO Form 349	4-5D

TABLE 4-5b. (Sheet 26 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
14 (Cont)	d. Occurrences by WUC, system, subsystem (monthly + 5 months)	DO56	LOG-MMO(AR)7170 DO56B5006	AFTO Form 349	4-5D
	e. Relating failures to inspection interval				
	(1) By WUC, how mal, action taken, and when discovered codes	DO56	LOG-MMO(AR)7173 DO56B5010	AFTO Form 349	4-5D
	(2) By WUC, equipment class (provides quantity and labor hours related to inspection interval)	DO56	LOG-MMO(AR)7174 DO56B5011	AFTO Form 349	4-5D
	f. EUMR, UMR by MDS, WUC	DO56	LOG-MMO(M)7178 DO56B5015	GO33 Report, AF Form 359, AFTO Form 349	4-5D
	g. Summary by system, subsystem, and WUC	DO56	LOG-MMO(AR)7183 DO56B5022	AFTO Form 349	4-5D
	h. By selected FIIN that exceed established limits for true actions (provides: repairs, NRTS, condemned, serviced, other actions)	DO56	LOG-MMO(AR)7188 DO56C4402	AFTO Form 346, 349	4-5D

TABLE 4-5b. (Sheet 27 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
14 (Cont)	i. By selected FIIN (follow-up report to DO56C4402)	DO56	LOG-MMO(AR)7189 DO56C4403	AFTO Form 346, 349	4-5D
	j. PME maintenance actions				
	(1) By WUC, schedule and unscheduled (provide number of units by action taken code)	DO56	LOG-MMO(SA)71105 DO56C5929	AFTO Form 346, 349	4-5D
	(2) Calibration interval analysis by WUC (indicates required change to schedule)	DO56	LOG-MMO(SA)71106 DO56C5930	AFTO Form 346, 349	4-5D
	k. Maintainability/reliability summary by weapon system, subsystem or WUC (aircraft only). (Provides maintenance action totals, MH/FH).	DO56	LOG-MMO(AR)7220 DO56B5527	AFTO Form 349	4-5D
	l. By safety code summary by MDS, subsystem (codes include safe, marginal critical, catastrophic)	MSIDS	Safety code report	AFFTC Form 300	4-5I

TABLE 4-5b. (Sheet 28 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
14 (Cont)	m. By when discovered code (WDC)				
	(1) For selected WUC	DO56	LOG-MMO(AR)7184 DO56B5023	AFTO Form 349	4-5D
	(2) For selected FIIN	DO56	LOG-MMO(AR)7189 DO56C4403	AFTO Form 349	4-5D
	(3) Daily by Eq. Cl.	AFM 66-1 MDCS	SG001B321/322	AFTO Form 349	4-5A
	(4) Monthly by Eq. Cl.	AFM 66-1 MDCS	SG001N501/502	AFTO Form 349	4-5A
	(5) Daily for serially controlled/time change items	AFM 66-1 MDCS	SG001B326	AFTO Form 349	4-5A
	(6) Monthly for serially controlled/time change item	AFM 66-1 MDCS	SG001B506	AFTO Form 349	4-5A
15	Mean Time Between Failures (MTBF)				
	a. CEM 12 month summary by TMS	AFR 65-110 GO33	23165A/GGT1F0BA	AF Form 2445	Section b 4-5C
	b. By WUC, system, subsystem (equipment category)	DO56	LOG-MMO(AR)7170 DO56B5006	AFTO Form 349	4-5D

TABLE 4-5b. (Sheet 29 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
15 (Cont)	c. Quarterly by system, subsystem, WUC	DO56	LOG-MMO(AR)7183 DO56B5022	AFTO Form 349	4-5D
	d. Quarterly for selected WUC (previous quarter, total failures for quarter and previous 12 months)	DO56	LOG-MMO(AR)7184 DO56B5023	AFTO Form 349	4-5D
16	Mean Time Between Maintenance (MTBM)				
	a. By WUC (5 digit), system and subsystem	DO56	LOG-MMO(AR)7170 DO56B5006	AFTO Form 349	4-5D
	b. Maintainability/reliability summary by weapon system, subsystem or WUC (aircraft only) (provides maintenance action totals, MH/FH)	DO56	LOG-MMO(AR)7220 DO56B5527	AFTO Form 349	4-5D
17	Mean Time to Repair (MTTR)				
	a. Maintenance downtime (scheduled, unscheduled, TCTO)				
	(1) By TMS, condition	AFR 65-110 GO33	HAF-LGY(M)7152 23115A/GGI1F0DA	AF Form 2445	Section b 4-5C

TABLE 4-5b. (Sheet 30 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
17 (Cont)	(2) Unscheduled by TMS, WUC	AFR 65-110 GO33	23125A/GGI5F0CA	AF Form 2445	Section b 4-5C
	(3) TMS 12 month summary	AFR 65-110 GO33	23165A/GGTIF0BA	AF Form 2445	Section b 4-5C
	b. Start/stop time				
	(1) ESR by organization	AFR 65-110 GO33	23135A/GGI9F0EA	AF Form 2445	Section b 4-5C
	(2) ESR by repair	AFR 65-110 GO33	23130A/GGI7F0EA	AF Form 2445	Section b 4-5C
	(3) Open incident start time	AFR 65-110 GO33	N265007 (Base) 23110A/GGAGF0DA	AF Form 2445	Section b 4-5C
18 (Cont)	NOR (Not Operationally Ready)				
	a. NORM/NORS and OR				
	(1) Unscheduled, scheduled, flyable and grounded/percent and hours)				
	(a) By organization, MDS, possession code	AFR 65-110 GO33	N260007	AF Form 359, 359a	Section a 4-5C
	(b) By hour of day for organization code	AFR 65-110 GO33	N260008	AF Form 359, 359a	Section a 4-5C
	(c) By organization station code, MDS, WUC	AFR 65-110 GO33	N260009	AF Form 359, 359a	Section a 4-5C

TABLE 4-5b. (Sheet 31 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
18 (Cont)	(d) Daily and month to date by assignment status code, MDS	AFR 65-110 GO33	GGB7F0A	RCS:HAF-LGY(D) 7140 AF Form 359	Section a 4-5C
	(e) By subcommand/ numbered AF, assignment code, MDS (daily and to date)	AFR 65-110 GO33	GGB7F0A	RCS:HAF-LGY(D) 7140 AF Form 359	Section a 4-5C
	(2) NORM				
	(a) Force summary (schedule and unscheduled by MDS)	IROS(KO51)	LOG-MMO(Q)7372 KO51.YR1L (Part I)	DO56, GO33 Reports, AF Form 359, *AFTO Form 349*	4-5E
	(b) Force summary (total NORM hours per flying hour by MDS)	IROS(KO51)	LOG-MMO(Q)7372 KO51.YR1L (Part II)	DO56, GO33 Reports, AF Form 359, AFTO Form 349	4-5E
	(c) Scheduled NORM by tail number	IROS(KO51)	LOG-MMO(Q)7216 KO51.YN6M	DO56, GO33 Reports, AF Form 359, AFTO Form 349	4-5E
	(d) Unscheduled norm by tail number	IROS(KO51)	LOG-MMO(Q)7216 KO51.YN6M	DO56, GO33 Reports, AF Form 359, AFTO Form 349	4-5E

TABLE 4-5b. (Sheet 32 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
18 (Cont)	(e) Depot by tail number	IROS(KO51)	LOG-MMO(Q)7216 KO51. YN6M	DO56, GO33 Reports, AF Form 359, AFTO Form 349	4-5E
	(f) Unscheduled NORM by WUC, MDS, prime ALC	IROS(KO51)	LOG-MMO(Q)7216 KO51. YN4M	DO56, GO33 Reports, AF Form 359, AFTO Form 349	4-5E
	(g) Unscheduled NORM analysis by WUC (2nd digit), MDS (force summary)	IROS(KO51)	LOG-MMO(Q)7372 KO51. YR1L (Part I)	DO56, GO33 Reports, AF Form 359, AFTO Form 349	4-5E
	(h) Trainer equipment NORM-G, NORM-F (scheduled and unscheduled)	AFR 65-110 GO33	N272003	AF Form 359	Section c 4-5C
	(3) NORS				
	(a) Force summary by MDS	IROS(KO51)	LOG-MMO(Q)7372 KO51. YR1L	DO56 and GO33 Reports, AF Form 359, AFTO Form 349	4-5E

TABLE 4-5b. (Sheet 33 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
18 (Cont)	(b) NORS hours by WUC, MDS, prime ALC	IROS(KO51)	LOG-MMO(Q)7216 KO51. YN4M	DO56 and GO33 Reports, AF Form 359, AFTO Form 349	4-5E
	(c) NORS hours by tail number (data for depot and base level)	IROS(KO51)	LOG-MMO(Q)7216 KO51. YN6M	DO56 and GO33 Reports, AF Form 359, AFTO Form 349	4-5E
	b. NOR top 25 by MDS, WUC	AFR 65-110 GO33	GGBDF0B	DO56 and GO33 Reports, AF Form 359, AFTO Form 349	Section a
	c. NOR monthly summary of unscheduled item by MDS, WUC	AFR 65-110 GO33	GGJ3F0A	DO56 and GO33 Reports, AF Form 359, AFTO Form 349	4-5E
	d. NORS start/stop	SBSS	HAF-LGS(AR)7113 (D23/854)	AF Form 2005	4-5G
	e. Due-outs	SBSS	D18/820	AF Form 2005	4-5G
	f. SRD due-out summary	SBSS	Q14/878	AF Form 2005	4-5G

TABLE 4-5b. (Sheet 34 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
19	NRTS (Not Reparable This Station)				
	a. Off-equipment by MDS, ALC, WUC	IROS(KO51)	LOG-MMO(Q)7215 KO51.PN7L	DO56, GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	b. By selected FIIN	DO56	LOG-MMO(AR)7189 DO56C4402	AFTO Form 346, 349	4-5D
	c. Follow-up to DO56C4402	DO56	LOG-MMO(AR)7189 DO56C4403	AFTO Form 346, 349	4-5D
	d. Quarterly command summary	DO56	LOG-MMO(Q)7193 DO56C5009	AFTO Form 349	4-5D
	e. Quarterly base summary	DO56	LOG-MMO(Q)7194 DO56C5010	AFTO Form 349	4-5D
	f. 12 month summary by selected FIIN (plus last month or quarter as requested)	DO56	LOG-MMO(AR)7195 DO56C4417	AFTO Form 346, 349	4-5D
	g. By equipment classification code, command (quarterly summary)	DO56	LOG-MMO(Q)71103 DO56C5027	AFTO Form 346, 349	4-5D

TABLE 4-5b. (Sheet 35 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
20	Operating Time				
	a. Force summary, by WUC, system, subsystem (per month + 6 months)	DO56	LOG-MMO(AR)7170 DO56B5006	AFTO Form 349	4-5D
21	Operational Readiness				
	a. Force summary by MDS	IROS(KO51)	LOG-MMO(Q)7372 KO51.YR1L (Part I)	DO56, GO33 Reports AFTO Form 349, AF Form 359	4-5E
22	Piece Part Replaced				
	a. Daily by equipment classification, WUC	AFM 66-1 MDCS	SG001B325	AFTO Form 349	4-5A
	b. Monthly by equipment classification, WUC	AFM 66-1 MDCS	SG001B505	AFTO Form 349	4-5A
	c. During field or depot repair by FIIN (follow-up to DO56C4403)	DO56	LOG-MMO(AR)7190 DO56C4404	AFTO Form 349	4-5D
	d. Bit and piece replacement summary by end item, WUC	DO56	LOG-MMO(AR)7191 DO56C5605	AFTO Form 349	4-5D

TABLE 4-5b. (Sheet 36 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
23	Possessed Hours				
	a. By organization, MDS, possession code	AFR 65-110 GO33	260007	AF Form 359, 359a	Section a 4-5C
	b. By assignment status code, MDS	AFR 65-110 GO33	GGB7F0A	RCS:HAF-LGY(D) 7140 AF Form 359, 359a	Section a 4-5C
	c. By sub-command/numbered AF, assignment code, MDS	AFR 65-110 GO33	GGB7F0B	RCS:HAF-LGY(D) 7140 AF Form 359, 359a	Section a
	d. By MDS, serial number	AFR 65-110 GO33	GGJ7F0A	RCS:HAF-LGY(D) 7140 AF Form 359, 359a	Section a
	e. By using command, MDS	IROS(KO51)	LOG-MM(Q)7372 KO51.YR1L (Part I)	GO33 Report, AF Form 359, 359a	4-5E
	f. Force summary by MDS	IROS(KO51)	LOG-MM(Q)7372 KO51.YR1L (Part I)	GO33 Report, AF Form 359, 359a	4-5E

TABLE 4-5b. (Sheet 37 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
23 (Cont)	g. By MDS and tail number (base, depot)	IROS(KO51)	LOG-MMO(Q)7216 KO51. YN6M	GO33 Report, AF Form 359, 359a	4-5E
24	Quantity per Application (QPA)				
	a. WUC to end piece of equipment	DO56	LOG-MMO(AR)7170 DO56B5006	AFTO Form 349	4-5A
25	Reliability				
	a. Flight reliability (force summary by MDS)	IROS(KO51)	LOG-MM(Q)7372 KO51. YR1L (Part I)	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	b. Before flight reliability (force summary by MDS)	IROS(KO51)	LOG-MM(Q)7372 KO51. YR1L (Part I)	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	c. Force degradation contribution				
	(1) Ranking top 20 WUC	IROS(KO51)	LOG-MMO(Q)7216 KO51. YN1L KO51. YN3M	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E

TABLE 4-5b. (Sheet 38 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
25 (Cont)	(2) By MDS tail number	IROS(KO51)	LOG-MMO(Q)7216 KO51. YN5M	DO56 and GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	d. By MDS, major subsystem				
	(1) Mean hours between:				
	(a) Function degradation	MISEDS	Aircrew evaluation summary	AFFTC Form 300	4-5I
	(b) Function loss	MISEDS	Aircrew evaluation summary	AFFTC Form 300	4-5I
	(c) Mission abort	MISEDS	Aircrew evaluation summary	AFFTC Form 300	4-5I
	(2) Probabilities of NO function degradation, loss or abort	MISEDS	Aircrew evaluation summary	AFFTC Form 300	4-5I
	(3) Discrepancies per flight hour and mission by WUC	MISEDS	Flight crew discovered discrepancy report	AFFTC Form 300	4-5I
26	Safety				
	a. Safety code summary by MDS, subsystem (codes include safe, marginal, critical, and catastrophic)	MISEDS	Safety code report	AFFTC Form 300	4-5I

TABLE 4-5b. (Sheet 39 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
26 (Cont)	b. EUMR, UMR summaries by MDS, WUC (provides QPA, failure rates, MTBM, MTBF and predictions)	DO56	LOG-MMO(M)7178 DO56B5015	AFTO Form 349	4-5D
27	Serially Controlled/Time Change Items Scheduled Maintenance				
	a. By performing work center (PWC), ID number, end item identify	AFM 66-1 MDCS	SG001B162	AFTO Form 349	4-5A
	b. By owning work center (OWC), ID number, end item identity	AFM 66-1 MDCS	SG001B163	AFTO Form 349	4-5A
	c. Daily, by equipment class. type maintenance (TM), WUC	AFM 66-1 MDCS	SG001B326	AFTO Form 349	4-5A
	d. Monthly, by equipment classification, TM, WUC	AFM 66-1 MDCS	SG001B506	AFTO Form 349	4-5A
	e. Master MDC ID listing				
	(1) By ID number, end item ident.	AFM 66-1 MDCS	SG001B151	AFTO Form 349	4-5A
	(2) By OWC, end item ident.	AFM 66-1 MDCS	SG001B152	AFTO Form 349	4-5A

TABLE 4-5b. (Sheet 40 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
27 (Cont)	(3) By end item	AFM 66-1 MDCS	SG001B153	AFTO Form 349	4-5A
	(4) By PWC, end item identification	AFM 66-1 MDCS	SG001B154	AFTO Form 349	4-5A
28	Sorties				
	a. By organization station code, MDS serial number	AFR 65-110 GO33	N260010	AF Form 359	Section a 4-5C
	b. By *system, subsystem,* and WUC failures (quarterly summary)	DO56	LOG-MMO(AR)7183 DO56B5022	AFTO Form 349	4-5D
	c. Force summary by MDS (includes support, training and operations flights)	IROS(KO51)	LOG-MM(Q)7372 KO51. YR1L (Part I)	DO56, GO33 Reports, AFTO Form 349, AF Form 359, 781	4-5E
	d. By MDS and tail number (includes attempted sorties data)	IROS(KO51)	LOG-MMO(Q)7216 KO56. YN6M	DO56, GO33 Reports, AFTO Form 349, AF Form 359, 781	4-5E

TABLE 4-5b. (Sheet 41 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
29	System Effectiveness				
	a. Force summary by MDS	IROS(KO51)	LOG-MM(Q)7372 KO51. YR1L (Part I)	DO56, GO33 Reports, AFTO Form 349, AF Form 359	4-5E
	b. Base in-house repair capability	SBSS	Q04/819	AF Form 2005	4-5G
	c. Organizational repair capability effectiveness	SBSS	M24/863	AF Form 2005	4-5G
30	Utilization				
	a. Trainer utilization (T1, T3) T1 = student training T3 = operator training	AFR 65-110 GO33	N272003	AF Form 359	Section c 4-5C
31	Work Load Distribution				
	a. Histogram, average number of workers by hour of day	AFM 66-1 MDCS	SG001B812	AFTO Form 349	4-5A
	b. Productive man-hours by hour of day (histogram)	AFM 66-1 MDCS	SG001B813	AFTO Form 349	4-5A
	c. Productive man-hours by day of month (histogram)	AFM 66-1 MDCS	SG001B814	AFTO Form 349	4-5A

TABLE 4-5b. (Sheet 42 of 42)

Item	Data Element/Parameter	Data System	Report RCS/PCN	Source Document	Reference (Handbook Appendix)
31 (Cont)	d. Workload saturation, man-hours by hour of day	AFM 66-1 MDCS	SG001B815	AFTO Form 349	4-5A
	e. Workload saturation, man-hours by day of month	AFM 66-1 MDCS	SG001B816	AFTO Form 349	4-5A

TABLE 4-5c(1). OUTPUT REPORT DATA MATRIX, AEROSPACE VEHICLE AND EQUIPMENT INVENTORY, STATUS, AND UTILIZATION REPORTING SYSTEM (AFR 65-110)

Source Documents: AF Form 359 (for Aerospace Vehicles and Training
AF Form 2445 (for CEM)

			Maintenance/Failure Information											Time/Frequency In												
No.	Report No.	Report Title	Condition Code	Delay Code	Downtime Code	Mission Capability Code	NORM (Actions/Time/%)	NORS (Actions/Time/%/Rate)	Numbers of Failures	Numbers of Maint. Actions	Operational Ready (No./%)	Status Code		Delay Time (Start/Stop/hr)	Delay Time (Supply)	Flying Hours	Landings	Maint. Downtime (Scheduled)	Maint. Downtime (Unscheduled)	Mean Downtime	MTBF	MTTR	Possessed Hours (Avg. hrs)	Sorties	Start-Stop Ti	Utili
A.	AEROSPACE VEHICLE REPORTS, RCS:HAF-LGY(D)7140																									
1	N260007	Aerospace Vehicle Status Report					X	X			X												X			
2	N260008	Aerospace Vehicle Status Distribution Report					X	X			X															
3	N260009	Aerospace Vehicle WUC Report					X	X								X	X							X		
4	N260010	Aerospace Vehicle Flying Report																								
5	N260011	Aerospace Vehicle MCS Summary Report														X								X		
6	GGB7F0A	Aerospace Vehicle Status					X	X			X												X			
7	GGB7F0B	Aerospace Vehicle Status					X	X			X												X			
8	GGBDF0B	Top 25 Unscheduled Item NORM/NORS					X	X																		
9	GGJ3F0B	Summary of Unscheduled Items NOR					X	X																		
10	GGJ7F0A	Aircraft Inventory														X							X			
11	GGJBF0A	Aerospace Vehicle Flying Report														X										
12	GGJBF0B	Aerospace Vehicle Flying Report														X										
B.	CEM REPORTS, RCS:HAF-LGY(M)7152																									
1	N265007	Daily Detail Status (Open Incidents Only)	X	X	X	X								X											X	
2	N265008	CEM Master Inventory by Organization																								
3	23110A	Daily Detail Status (Open Incidents Only)	X	X	X	X								X											X	
4	23115A	Command CEM Equipment Status Summary	X							X					X		X	X								
5	23125A	Monthly WUC Summary - Unscheduled Maintenance Downtime							X					X					X							
6	23130A	Monthly CEM Detailed ESR Listing by TMS	X	X	X	X																			X	
7	23135A	Monthly CEM Detailed ESR Listing by Organization	X	X	X	X																			X	
8	23140A	Monthly CEM Master Inventory by TMS																								
9	23145A	Monthly CEM Master Inventory by Organization																								
10	23146A	TMS Totals by Subcommand																								
11	23150A	Monthly WUC Summary - Supply Delays	X					X							X											
12	23165A	End Item Summary by TMS	X											X	X					X	X	X				
C.	TRAINER REPORTS, RCS:HAF-DPM(M)7101, 2, 3																									
1	N272003	Monthly Base Level Trainer Status Summary Report	X			X	X	X				X											X			X
2	N22403A	Monthly Base Level Trainer Status Summary Report	X			X	X	X				X											X			X

/

Maintenance/Failure Information									Time/Frequency Information													Inventory Info.				System-Equipment Identification								Geographical ID.		
Delay Code	Downtime Code	Mission Capability Code	NORM (Actions/Time/%)	NORS (Actions/Time/%/Rate)	Numbers of Failures	Numbers of Maint. Actions	Operational Ready (No./%)	Status Code	Delay Time (Start/Stop/hr)	Delay Time (Supply)	Flying Hours	Landings	Maint. Downtime (Scheduled)	Maint. Downtime (Unscheduled)	Mean Downtime	MTBF	MTTR	Possessed Hours (Avg. hrs)	Sorties	Start-Stop Time	Utilization (Time)	Quantity (Total/Avg.)	Number Possessed (Total/Avg.)	Gain/Loss Time	Possession Code	Assignment Status Code	Mission Design Series	Mission Symbol/Type	PEC	Type Mission Series	Work Unit Code	Serial No.	ESR No.	Base/Station	Command/Subcommand Code	Organization Station Code
			X	X			X											X					X			X	X									X
			X	X			X																				X									X
			X	X							X	X							X				X				X				X					X
																										X	X	X				X				X
											X								X				X			X	X		X						X	X
			X	X			X											X								X	X								X	
			X	X			X											X								X	X							X	X	X
			X	X																							X				X					
			X	X																							X				X					
											X							X						X		X	X					X		X	X	X
											X															X	X	X								X
											X															X	X	X								
X	X	X							X											X										X	X	X	X		X	X
																								X						X		X			X	X
X	X	X							X											X										X	X	X	X		X	X
						X				X		X	X																	X						
					X				X					X																X	X					X
X	X	X																		X										X	X	X	X		X	X
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				X						X																				X	X					
									X	X					X	X	X													X						
		X	X	X				X										X			X			X	X	X						X		X	X	X
		X	X	X				X										X			X			X	X	X						X		X	X	X

Table 4-5c(1)

2

TABLE 4-5c(2). OUTPUT REPORT DATA MATRIX
ENGINE MANAGEMENT PRODUCTS (DO24)

Source Document: AF Form 1534

Time/Frequency Information

No.	Report No.	Report Title	Age (Engine Age)	– Average Age	As of Date	Asset Days	Actuarial Engine Life	Actuarial Life Remaining	Operating Time	Engine Exposure	Engine Life Expectancy	Flying Hours (FH)	– FH/Overhaul Hours	– FH/Field Maint. Hours	Hours Since OH/FM	Overhaul Removal Interval	Pipeline Analysis	Resupply Time	Utilization Rates	Overhaul/Field Maint. Exposure	ENORS Percent	ENORS Age (Days)	ENORS Cleared	ENORS Outstandin	Failures	– Av
1	DO24AEH1A	Propulsion Unit Oper. Time and Reconciliation Report (Part 1)							X																	
2	DO24AEH1A	Propulsion Unit Oper. Time and Reconciliation Report (Part 2)			X																					
3	DO24BBE1W	ENORS Uninstalled Engine Status Report Summary by Cmd.				X															X	X	X	X		
4	DO24BBE2W	ENORS Command History				X															X	X	X	X		
5	DO24BBJ1W	ENORS Uninstalled Engine Status Report				X															X	X	X	X		
6	DO24BBN1W	ENORS Uninstalled Engine Status Report Type																				X	X	X		
7	DO24BBR1W	ENORS Uninstalled Engine Status Report by Serial No.			X																					
8	DO24BCD1M	Propulsion Unit Reparable Report			X				X																	
9	DO24BGU1M	Propulsion Unit Foreign Object Damage Report							X																	
10	DO24BJG2M	Propulsion Unit Report System Overhaul and Base Maint. Comp.			X																					
11	DO24CDC3W	Spare Engine Report			X				X																	
12	DO24CHS1M	OCALC Prop. Unit Resupply Time Report, Part 1																X								
13	DO24DAE1Q	Prop. Unit Pipeline Analysis, Part 2															X									
14	DO24FI021	Installed Aircraft Engine Report		X							X															
15	DO24FI022	Official Failure Rate Tech. Data Record	X				X				X															
16	DO24FI023	Aircraft Engine Exposure Product	X							X										X						
17	DO24FI031	Aircraft Engine Removal/Loss Report													X											
18	DO24FN021	Aircraft Engine Exposure Product	X							X		X							X	X						
19	DO24FN022	Aircraft Engine Combined Fail Rate Prod.	X							X										X						
20	DO24FN023	Aircraft Engine Experience Analysis Report										X	X	X											X	
21	DO24FR011	Aircraft Engine Overhaul Failure Rate Product	X							X															X	
22	DO24FR021	Aircraft Engine Field Maint. Failure Rate Product	X							X															X	
23	DO24FR031	Aircraft Engine Combined Failure Rate Product	X							X		X													X	X
24	DO24FR041	Aircraft Engine Overhaul Failure Rate Product								X		X													X	X
25	DO24FR051	Aircraft Engine Field Maint. Failure Rate Product	X							X		X													X	X
26	DO24FY011	Aircraft Engine Experience Analysis Product										X	X	X												
27	DO24KP031	Forecasted Aircraft Engine Removals by Quarter																								
28	DO24KP041	Forecasted Aircraft Engine Removals by Command																								
29	DO24KP061	Official USAF Actuarial Removal Interval and Eng. Life Expectancy Tables					X																			

1

rmation			Failure Data																		Maintenance/ Overhaul							Inv. Qty			Engine/Aircraft ID									Location					
Utilization Rates	Overhaul/Field Maint. Exposure		ENORS Percent	ENORS Age (Days)	ENORS Cleared	ENORS Outstanding	Failures	– Ave. Age at Failure	– Usage Failure	– Expected Failures	– Failure Rate Products	– Field Maint. Failure Rate	– Overhaul Failure Rate	– Combined Failure Rate	Foreign Object Damage	Index of Dependability	Return Rate	Status	Official Failure Rate		Correction Code	Removals (Forecasted)	Removal (Reason)	Removals (Code/Description)	Program Code	Removal Intervals		On-Hand	Quantity		A/C Designation	A/C Serial Number	Engine Designation	Engine Type	Position Number	Family Group	Serial No. (A/C)	Serial No. (Engine)		Account Code	Base No./Name	Command Code	Last Overhaul Agency	Station No./Name	
																															X		X		X		X	X		X		X		X	
																															X		X				X	X		X		X		X	
			X	X	X	X																						X								X						X		X	
			X	X	X	X																						X						X								X			
			X	X	X	X																						X								X								X	
				X	X	X																						X						X											
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																						X				X																			

Table 4-5c(2)

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TABLE 4-5c(3). OUTPUT REPORT DATA MATRIX
MACHINE INDEPENDENT SYSTEM
EFFECTIVENESS DATA SYSTEM (MISEDS)

Source Documents: AFSC Form 258,
AFFTC Form 300

Maint/Fail Info

No.	Report No.	Report Title	Action Taken Code	How Mal Code	Number of Tasks/Units	When Discovered Code	Malfunction Description	Percent of Totals	
1	None	Personnel Subsystem Test and Evaluation Report (PSTE)			X				
2		Flight Crew Discovered Discrepancy Report							
3		258 EDIT Program		X		X			
4		Active Man-Hour Task Summary (AMTS) Report			X				
5		Subsystem Maintenance Man-Hour per Flying Hour Report							
6		Aircraft Maintenance Man-Hour per Flying Hour Report							
7		Aircrew Evaluation Summary							
8		Aircrew Evaluation Analysis (Part 1)							
9		Aircrew Evaluation Analysis (Part 2)							
10		Safety Code Report					X		
11		Maintenance Event Report	X	X		X			
12		AGE Utilization Report							
13		Action Taken Report	X						
14		Subsystem Maintenance Action Summary			X			X	
15		Component Discrepancy Report	X	X	X				
16		In-Flight Discrepancy Report	X	X		X	X		
17	None	Flying Hours per System Report							

Time/Freq Info

No.	Report No.	Report Title	AGE Utilization	Delay Time	Discrepancies/Flt. Hour	Discrepancies/Mission	Elapsed Time Indicated	Flt. Hours per System/Subsys.	Operating Time	Operating Time/100 FH	Start-Stop Time	Tasks/Flt. Hour	Time (Hours)	
1	None	Personnel Subsystem Test and Evaluation Report (PSTE)												
2		Flight Crew Discovered Discrepancy Report			X	X								
3		258 EDIT Program		X			X				X			
4		Active Man-Hour Task Summary (AMTS) Report										X		
5		Subsystem Maintenance Man-Hour per Flying Hour Report												
6		Aircraft Maintenance Man-Hour per Flying Hour Report												
7		Aircrew Evaluation Summary											X	
8		Aircrew Evaluation Analysis (Part 1)												
9		Aircrew Evaluation Analysis (Part 2)												
10		Safety Code Report												
11		Maintenance Event Report												
12		AGE Utilization Report	X						X	X				
13		Action Taken Report												
14		Subsystem Maintenance Action Summary												
15		Component Discrepancy Report												
16		In-Flight Discrepancy Report												
17	None	Flying Hours per System Report						X						

System Effectiven

No.	Report No.	Report Title	Aborts	Function Successes	Function Degradations	FNC Losses	Mean Hrs. Between Func. Degr.	Mean Hrs Between Func. Loss	Mean Hrs Between Abort	Probability of No Func. Degr.	Probability of No Func. Loss	Probability of Abort	Reliability (Cod	Safety (
1	None	Personnel Subsystem Test and Evaluation Report (PSTE)												
2		Flight Crew Discovered Discrepancy Report												
3		258 EDIT Program												
4		Active Man-Hour Task Summary (AMTS) Report												
5		Subsystem Maintenance Man-Hour per Flying Hour Report												
6		Aircraft Maintenance Man-Hour per Flying Hour Report												
7		Aircrew Evaluation Summary	X	X	X	X								
8		Aircrew Evaluation Analysis (Part 1)					X	X	X					
9		Aircrew Evaluation Analysis (Part 2)								X	X	X		
10		Safety Code Report											X	X
11		Maintenance Event Report												
12		AGE Utilization Report												
13		Action Taken Report												
14		Subsystem Maintenance Action Summary												
15		Component Discrepancy Report												
16		In-Flight Discrepancy Report												X
17	None	Flying Hours per System Report												

1

Time/Freq Info										System Effectiveness Info													Labor/Man-Hour Info												Equipment ID											Loc. ID	
Flt. Hour	pancies/Mission	Elapsed Time Indicated	Flt. Hours per System/Subsys.	Operating Time	Operating Time/100 FH	Start-Stop Time	Tasks/Flt. Hour	Time (Hours)		Aborts	Function Successes	Function Degradations	FNC Losses	Mean Hrs	Mean Hrs. Between Func. Degr.	Mean Hrs Between Func. Loss	Mean Hrs Between Abort	Probability of No Func. Degr.	Probability of No Func. Loss	Probability of Abort	Reliability (Code)	Safety (Code)	AFSC	Man-Hours (MH)	– Active MH	– Active MH/FH	– Active MH/Task	– Line MH	– MH/FH	– MH/Task	– Mean MH/Tsk	– Predicted MH	– Shop MH		Equipment Category/ID	Job Control No. (JCN)	Mission Design Series	Serial Number End Item	Serial Number Failed Item	Part Number	Tail No.	Work Order No.	Work Unit Code (WUC)	Subsystem/Equip. Noun		Work Center	
																								X					X	X	X	X											X				
																																											X				
						X																	X		X			X					X				X	X				X	X			X	
							X																	X	X	X	X		X	X													X				
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			X																																									X			

Table 4-5c (3)

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AD-A055 342 ARINC RESEARCH CORP ANNAPOLIS MD F/G 15/5

LOGISTICS ASSESSMENT. VOLUME I. TEXT.(U)

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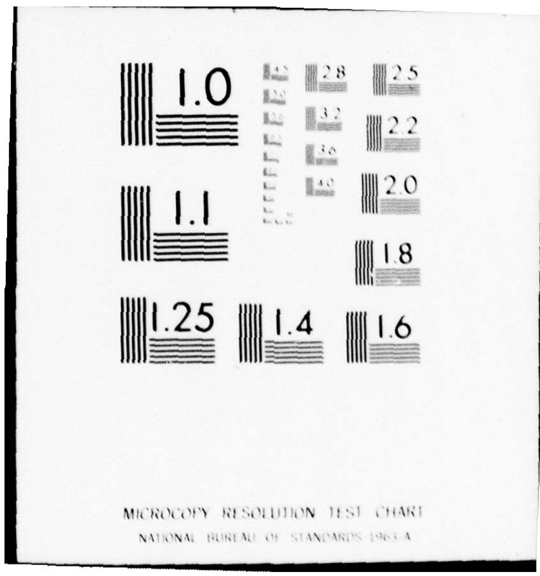
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4.0
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

TABLE 4-5c(4). OUTPUT REPORT DATA MATRIX
INCREASE RELIABILITY OF OPERATIONAL SYSTEMS
(IROS; KO51)

Source Documents: DO56 Product Performance System; GO33 Aerospace Vehicle Inventory, Equipment, and Status Report

			Cost Information																System Effectiveness Info.											Qty						
No.	Report No.	Report Title	LSC - Average/Prop. Share	- Per Hour/Month/System	- Force/Month	- Field Maint.	- Spec. Repairs	- Pack/Shipping	- Condemnations	- Base Material	- NSN LSC	Unit Prices	Cost/Operating Hour	TCTO Man-Hour Cost		Aborts	- Before Flight	- In-Flight	Availability	- Alert Avail.	- Non-Avail.	- - NORM/NORS	Force Degradation Contrib.	Operational Readiness	Reliability (Flight)	Reliability Before Flt.	System Effectiveness	NORS		Force Totals	Number Possessed	Inventory (Installed/Spec.)	Aircraft Inventory	QPA		
1	KO51. YR1L	System Effectiveness Report, Force Summary																	X	X	X	X		X	X	X	X									X
2	KO51. YR1L	System Effectiveness Report, Trend Data																		X				X	X	X	X									
3	KO51. PW5L	LSC Ranking, Selected Equip. WUCs	X																																	
4	KO51. PN1L	LSC Ranking, Selected Items			X																															
5	KO51. PN3L	LSC Ranking, WUC Status			X									X																X			X			X
6	KO51. PN4L	LSC Breakdown - Current Quarter				X	X	X	X	X																										
7	KO51. PN6L	LSC Ranking, NSN Status									X																									
8	KO51. PN7L	Maintenance Action Summary														X	X	X																		
9	KO51. PN8L	LSC File Maintenance Register										X																						X		
10	KO51. PW2L	LSC Ranking Item Mgr NSN Status									X																									
11	KO51. PW3L	LSC Ranking, High Burner WUC		X	X																											X				
12	KO51. PW4L	LSC Ranking, Weapon System Correlation											X																				X			X
13	KO51. PZ1L	LSC Ranking, Ground CEM Equipment	X		X																									X						
14	KO51. YN1L	System Avail. Selected WUCs																					X													
15	KO51. YN3M	System Avail. WUC Status																					X													
16	KO51. YN4M	System Avail. WUC Comp. Data															X	X														X		X		
17	KO51. YN5M	System Avail. Aircraft Status																	X				X													
18	KO51. YN6M	System Avail. Aircraft Comp. Data														X	X	X										X								X

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System Effectiveness Info.							Qty Inventory						Time/Frequency Info.													Maint. /Failure Info.									System-Equip ID							Loc. ID	
Force Degradation Contrib.	Operational Readiness	Reliability (Flight)	Reliability Before Flt.	System Effectiveness	NORS		Force Totals	Number Possessed	Inventory (Installed/Spec.)	Aircraft Inventory	QPA		Flight Hours	Hours Possessed	Landings	NORM Hrs/FH	- Scheduled	- Unscheduled	NORS Hrs/FH	Operating Hours	Sorties	- Attempted Sorties	Use Factor	Utilization		Actions (Maint. /Hours)	- Condemned	- Expended	- NRTS	- Repairs	- To-Shop	ERRC	Percent System		Equipment Category	MDS	NSN	Tail No.	WUC	FSC		Air Logistics Center	
	X	X	X	X									X	X							X			X												X						X	
	X	X	X	X												X	X	X	X																	X			X			X	
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					X								X	X							X	X				X										X		X				X	

Table 4-5c (4)

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TABLE 4-5c(5). OUTPUT REPORT DATA MATRIX
PRODUCT PERFORMANCE SYSTEM (DO56)

Source Documents: RCS:LOG-MMO(AR)7142
AFTO Form 349
AFTO Form 346

			Maintenance/Failure Information																									Cost						
No.	Report No.	Report Title	Aborts	Accidents/Incidents	Action Taken Codes	Cannibalizations	ERRC	EUMR	How Mal Codes	Maintenance Actions	- Bench Check Serviceables	- Failure Occurrences	- No-Defect Actions	- Other Malfunction	- Percent Failures	- Replacements	- Shop Actions	- - Repairs	- - Condemned	- - NRTS (Valid/Invalid)	When Discovered Codes	TCTOs	Units (Number Actions)	- On-Equipment	- Off-Equipment	Corrosion Summary		Cost Data		Abort Rate	Aborts/1000 FH	Calibrate/Inspect[illegible]	Fail Rate	- [illegible]
1	DO56B5006	Maint. Actions, Man-Hours, and Aborts by WUC	X									X		X			X	X	X	X														
2	DO56B5010	Inspection Interval			X				X												X		X									X		
3	DO56B5011	Inspection Occurrence Interval								X	X																					X		
4	DO56B5015	Material Safety Deficiency Report	X	X				X				X																		X			X	X
5	DO56B5016	Work Unit Code Corrosion Summary																					X			X		X						
6	DO56B5017	System/Subsystem Corrosion Summary																					X			X		X						
7	DO56B5022	System/Subsystem WUC Failure Summary			X							X			X	X																		
8	DO56B5023	Failure Rate Data for Selected WUCs			X				X			X									X													
9	DO56B5025	Maint. MH/FH by Weapon, System, CMD																																
10	DO56B5503	Detail Maint. Action for Selected WUCs			X				X												X		X	X										
11	DO56B5504	Detail Shop Actions for Sel. WUCs			X				X		X	X	X	X				X	X	X			X		X									
12	DO56B5505	Sum'd Maint. Actions for Sel. WUCs																																
13	DO56B5527	Maintainability - Reliability Summary			X				X	X											X										X			
14	DO56B6528	Cannibalization Actions - CMD Summary				X																	X											
15	DO56B6529	Cannibalization Actions - by Weapon System				X																	X											
16	DO56C4402	Selected Part No. Action Summary					X			X	X			X				X	X															
17	DO56C4403	Maint. Actions for Selected FIINs	X		X				X				X					X	X	X	X													
18	DO56C4404	Part Replaced During Field or Depot Repair							X																									
19	DO56C4417	Maint. Reparable Processing Summary					X											X	X	X														
20	DO56C5009	USAF Command NRTS and Repaired Summary																X	X	X														
21	DO56C5010	Base NRTS and Repaired Summary																X	X	X														
22	DO56C5027	Equipment NRTS and Repaired Summary								X								X	X	X			X											
23	DO56C5605	Bit and Piece Replacement Summary							X								X																	
24	DO56C5903	PME Calibration Interval Analysis																					X									X		
25	DO56C5929	Summary of PME Maintenance Actions																					X									X		

			Cost		Time/Frequency Info.											Quantity Inv.			System-Equip. ID										Location ID			Man-Hours					
– Off-Equipment	Corrosion Summary	Cost Data	Abort Rate	Aborts/1000 FH	Calibrate/Inspect/Interval	Fail Rate	– Predicted Fail Rate	Failure Limit	MTBF	MTBM	Operating Time	Sorties	– Mean Sorties	Use Factor	Flying Hours	QPA	Quantity	Inventory	Equipment Category	Equipment Classification	FIIN	FSC	MDS (Mission Design Series)	Manufacturer	Part Number	Reference Symbol	Serial Number	WUC (Work Unit Code)	Air Logistics Center (ALC)	Base	Command/Command Code	Average MH/Occur or Unit	Man-Hour/Flight Hour	Unsched. Maint. MH	Sched. Maint. MH	Summary (CMD-Other)	Shop MH
								X	X	X						X		X	X									X	X					X	X		X
					X																		X					X	X							X	
					X																		X					X	X							X	
			X			X	X		X	X						X		X	X				X					X	X								
	X	X														X							X					X	X					X	X	X	
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																	X					X	X		X	X		X									
					X																				X			X		X							
					X																									X							

Table 4-5c (5)

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TABLE 4-5c(6). OUTPUT REPORT DATA MATRIX
MAINTENANCE COST SYSTEM (MCS)

Source Documents: RCS:LOG-MMO(AR)7142,
AFTO Form 349

			Cost (Dollars)												
No.	RCS:HAF-ACF(M)7405	Title	Base/Command Totals	Customer (Cost Summary)	FY Cumulatives	Labor – Civilian	– Contract Maint.	– Ind. Productive	– Ind. Non-Productive	– Military	Material (Funded)	Material (Unfunded)	Material (Gov't. Furnished)		Civilian
1	Report 1A	WBS Within MDS Within PEC	X		X	X	X	X	X	X	X	X	X		X
2	Report 1B	Non-MDS by WBS	X		X	X	X	X	X	X	X	X	X		X
3	Report 2A	WAC Within MDS Within PEC	X		X	X	X	X	X	X	X	X	X		X
4	Report 2B	Non-MDS by WAC	X		X	X	X	X	X	X	X	X	X		X
5	Report 3	By Indirect Productive Labor Category	X					X							
6	Report 4	By Indirect Non-Productive Category	X			X			X	X					X
7	Report 5	By Material Category	X								X		X		
8	Report 6	By Customer	X	X		X	X	X	X	X	X	X	X		X

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...er (Cost Summary)

Cost (Dollars)										Labor/Man-Hours					Base – Equip. Identification						
FY Cumulatives	Labor – Civilian	– Contract Maint.	– Ind. Productive	– Ind. Non-Productive	– Military	Material (Funded)	Material (Unfunded)	Material (Gov't. Furnished)		Civilian	Indirect Productive	Indirect Non-Productive	Military		Base/Station	MDS/Non-MDS	Organization Code	PEC	WAC	WBS	
X	X	X	X	X	X	X	X	X		X	X	X	X		X	X	X	X		X	
X	X	X	X	X	X	X	X	X		X	X	X	X		X	X	X			X	
X	X	X	X	X	X	X	X	X		X	X	X	X		X	X	X	X	X		
X	X	X	X	X	X	X	X	X		X	X	X	X		X		X		X		
			X								X				X	X	X	X			
	X			X	X					X		X	X		X	X	X	X			
						X		X							X	X	X	X			
	X	X	X	X	X	X	X	X		X	X	X	X		X		X				

Table 4-5c (6)

TABLE 4-5c(7). OUTPUT REPORT DATA MATRIX
MAINTENANCE DATA COLLECTION (MDC)
SYSTEM (AFM 66-1, 66-267)

Source Documents: AFTO Form 349

			Labor/Man-Hours Information										Maint/Failure Information										Time/Freq. Info.											
No.	Report No.	Report Title	Crew Size	Labor Category	Man-Hours (Total or Unspecified)	- Direct Labor MH	- Indirect Labor MH	- Estimated MH	- On-Equipment MH	- Off-Equipment MH	- Support General MH		Action Taken Code	How Malfunctioned Code	NORS Code	Number of Failures	Parts Replaced	Status Code	Type Maintenance Code	Units Produced	When Discovered Code		Date Due Calibration	Day	Engine Time	Frequency of Calib/Inspec.	Scheduling Code	Sortie No.	Start-Stop Time		Assignment Code	Component Posit	Data Cl	
1	SG001B151	MDC Master ID Listing by ID Number		X				X							X			X					X			X					X			X
2	SG001B152	MDC Master ID Listing by Owning Work Center		X				X							X			X					X			X					X			X
3	SG001B153	MDC Master ID Listing By End Item		X				X							X			X					X			X					X			X
4	SG001B154	MDC Master ID Listing by Performing Work Center		X				X							X			X					X			X					X			X
5	SG001B162	MDC Equip. Sched. Part I by Perform. Work Center		X				X							X			X					X			X								X
6	SG001B163	MDC Equip. Sched. Part II by Owning Work Center		X				X							X			X					X			X								X
7	SG001B321/501	MDC Daily/Monthly Trans. Listing Section A - On Equipment	X	X		X							X	X				X		X	X						X		X			X	X	X
8	SG001B322/502	MDC Daily/Monthly Trans. Listing Section B - Off Equipment	X	X		X							X	X				X		X	X						X		X			X	X	
9	SG001B323/503	MDC Daily/Monthly Trans. Listing Section C - Support General	X	X		X					X								X	X				X			X	X	X			X	X	X
10	SG001B324/504	MDC Daily/Monthly Trans. Listing Section D - Indirect Labor	X	X			X																						X					
11	SG001B325/505	MDC Daily/Monthly Trans. Listing Section E - Parts Replaced												X			X		X					X								X		
12	SG001B326/506	MDC Daily/Monthly Trans. Listing Section F - Serially Controlled Time Change											X	X					X					X								X		
13	SG001B327/507	MDC Daily/Monthly Trans. Listing Section G - Engine Remove and Replace																	X					X	X							X		X
14	SG001B511	MDC Work Summary, Part 1, Direct Labor by End Item				X			X	X									X	X														X
15	SG001B525	MDC Work Summary, Part 2, Direct Labor by Work Center		X		X			X	X									X	X														
16	SG001B535	MDC Work Summary, Part 3, Indirect Labor by Work Center		X			X																											
17	SG001B536	MDC Activity Identifier Summary, Part 3, Indirect Labor		X			X																											
18	SG001B541	MDC Activity Identifier Summary, Part 1 by PWC			X				X	X									X	X														X
19	SG001B542	MDC Activity Identifier Summary, Part 2 by AI			X				X	X									X	X														X
20	SG001B771	Aero-Veh (On-Equip) Job Ave/Perf. Hi-Lites (Month)			X								X							X														X
21	SG001B772	Off-Equip. Job Ave/Perf. Hi-Lites (Month)			X								X							X														
22	SG001B781	High-25 On-Equip. Failures (Month)														X																		X
23	SG001B791	High-25 Man-Hour Consuming Jobs (Month)			X				X	X																								X

1

Man-Hours rmation			Maint/Failure Information										Time/Freq. Info.								System – Equip. Identification Information																		Ceographical Identification					
MH	uipment MH	Support General MH	Action Taken Code	How Malfunctioned Code	NORS Code	Number of Failures	Parts Replaced	Status Code	Type Maintenance Code	Units Produced	When Discovered Code		Date Due Calibration	Day	Engine Time	Frequency of Calib/Inspec.	Scheduling Code	Sortie No.	Start-Stop Time		Assignment Code	Component Position	Data Class	End Item Identity	Engine ID No.	Equipment ID No.	Equipment Category	Equipment Classification	FSC	Job Control No. (JCN)	Mission Design Series	Part No. (EI, II, RI)	Reference Symbol	Serial No. (EI, II, RI)	TAG No. (AFTO Form 350)	Tech. Order/Tech. Note	Work Unit Code (WUC)		Activity Identifier	Air Logistics Center	Command/Command Code	Work Center (Owning)	Work Center (Performing)	
					X			X					X			X					X			X		X											X			X		X	X	
					X			X					X			X					X			X		X											X			X		X	X	
					X			X					X			X					X			X		X											X			X		X	X	
					X			X					X			X					X			X		X											X			X		X	X	
					X			X					X			X								X		X	X							X		X	X			X	X	X	X	
					X			X					X			X								X		X								X		X	X			X	X		X	
			X	X				X		X	X						X		X			X	X	X		X		X		X				X	X		X		X		X		X	
			X	X				X		X	X						X		X			X	X			X		X	X	X		X		X	X		X		X		X		X	
									X	X				X			X	X	X			X	X	X		X		X		X					X		X						X	
																			X											X							X						X	
				X			X		X					X								X				X		X	X	X		X	X	X	X		X						X	
			X	X					X					X								X				X		X	X	X				X	X	X	X						X	
									X					X	X							X		X	X			X		X	X				X								X	
									X	X														X		X		X															X	
									X	X																		X															X	
																																					X						X	
																																					X		X				X	
									X	X														X				X											X				X	
									X	X														X				X											X				X	
			X							X														X				X									X							
			X							X																			X			X											X	
						X																		X				X			X						X							
																								X				X									X							

Table 4-5c (7)

2

(a) Failure Data.

The definition of a failure, i.e., how failures are counted, differs between the MDCS and DO56 systems. These differences and certain unique aspects of each system are as follows:

1. Only code A how malfunctioned codes are counted as failures in the MDCS; induced failures (code B) are excluded (see paragraph 4-4a(1)(d) and appendix 4-2A). Thus the MDCS failure count does not represent total demand on the maintenance activity or supply resources. No off-equipment actions are involved in the identification of MDCS failures.

2. The DO56 failure count is related to repair/replacement action taken codes; the MDCS is not. Only action taken code Q (installed) or Y (troubleshoot) affect MDCS failure count. Any data class A or B how malfunctioned code in combination with action taken code Q or Y is a non-failure data class C for MDCS.

3. All how malfunctioned codes used for failure counting in the MDCS are used in the DO56. However, the DO56 also includes failures for how malfunctioned codes (correlated with appropriate action taken codes) 142, 143, and 750.

4. Induced failures in the DO56 (type 2) are consistent with those in the MDCS (code B) except that how malfunctioned code 948 (no defect — operator error) is counted as an induced failure in DO56 but as a non-failure (code C) in the MDCS; and how malfunctioned code 750 is included as an induced failure, class B, in MDCS, but as an inherent failure, type 1, with DO56. All other "no defect" failures, i.e., DO56 type 6 and MDCS how malfunctioned codes C and D, are consistent.

5. Unlike the DO56, the MDCS failure count includes components removed as reported failures that subsequently check serviceable in the shop. This method represents a true measure of demand for on-equipment maintenance resources. However, the DO56 method provides a more accurate indicator of supply replacement requirements based on a remove, repair, and return maintenance policy.

6. Neither the MDCS nor DO56 accounts for failures of items bench-checked upon removal from supply, i.e., when discovered code Y. Both DO56 and MDCS failure count are based on on-equipment reported defects only.

7. Unit count (units completed) is provided for in both the DO56 and MDCS. However, the DO56 does not include as a failure action taken code G when used with a type 1 how malfunctioned code at the fifth-digit WUC level. Because of this, the failure count from the MDCS for a WUC component (five digits) probably would be higher than the DO56 failure count. The MDCS products do not summarize failure experience at the system (two-digit) or subsystem (three-digit) levels as does the DO56, although this could be done manually or by using the Base Level Inquiry System (BLIS).

8. The MDCS does not provide MTBF values, whereas the DO56 does. Usually, MDCS failures must be arithmetically combined with flying/operating time to obtain MTBF computations. Some command-unique data automation systems feature an automated capability for performing this function.

(b) Man-Hour Data.

1. The primary source for computing man-hours per flying hour or sortie is the MDCS Work Summary, Part 1, Direct Labor by End Item (PCN SG001B511), AFM 66-267, paragraph 5-15a. The sorting sequence is:

a. Equipment classification by chief of maintenance

b. ID number, or end item identity if no ID number is assigned

c. Type maintenance

d. Performing work center.

2. By sorting based on-equipment classification codes, the following anomalies arise with respect to man-hour computations for a specific weapon system:

a. In-shop engine work will appear separately, and must be added to the man-hour expenditures shown for the aircraft. In-shop engine man-hours can be separately determined by a sort on the last two digits of the equipment class code because they are the same as those used by the associated aircraft.

b. The same equipment classification code (X99) is used for all R&D maintenance; therefore, during DT&E, engine in-shop man-hour expenditures cannot be correlated to a specific test aircraft using MDCS products, e.g., A-10 engine maintenance would not be distinguished from that for the F-16 engine. However, effective 1 October 76, a separate standard reporting designator (SRD) will be used for each engine. These new codes will replace the equipment classification codes.

c. Aircraft man-hour expenditures do not include expenditures for:

1) Aerospace ground equipment (EQCL code G). Some man-hours can be separately identified for peculiar AGE managed under the Advanced Configuration Management System (ACMS), and added to the end item man-hours. This will not include automatic test equipment coded in TO 51-1-06-1. Effective 1 October 1976, however, all peculiar support equipment, including automatic test equipment, is to have an SRD identifiable to the weapon system supported. Some air-launched missile and guided weapon AGE man-hours may be separately identified and added as with engine in-shop work

by selecting on the last two digits (weapon system peculiar) of the EQCL codes (see TO 00-20-2, page A2-9, -10.)

NOTE: No such capability exists for man-hours expended on common AGE coded in TO 00-25-06-2-2, PME coded from TO 33K-1-100, ATE coded in TO 51-1-06-1, shop support, life support equipment, or munitions (TO 11N-series WUC manuals).

2) Precision measurement equipment (EQCL code H)

3) Munitions air launched missiles and guided weapons (EQCL code Y)

4) ECM pods (EQCL codes A7 through A79)

5) Shop work on local manufacturers (EQCL code S), including items withdrawn from supply stock, except engines; and maintenance of war reserve material, life support equipment, and forward support spares.

3. Man-hours for uploading and downloading weapon release/launch equipment or ECM pods for mission configuration or failure are charged to the aircraft EQCL code. Uploadings/downloadings for configuration changes are reported using support general 01000 work unit code(s), whereas the weapons release/launch equipment WUCs from the aircraft WUC manual are used for upload/download actions because of failure(s).

4. There is no categorization of man-hours by scheduled or unscheduled events based on a standard grouping of type maintenance codes. Care should be taken in selecting type maintenance codes, if a man-hour separation into these two categories is desired, to avoid confusion with the DO56 values which are based on standard groupings of type maintenance codes.

5. Unlike failure data, there is an agglomeration of on-equipment man-hour expenditures by system, subsystem, and weapon system, and corresponding off-equipment values. These values are derived from the MDCS monthly transaction listing, section A (On-Equipment, PCN SG001B501) and section B (Off-Equipment, PCN SG001B502).

a. Support general data are not included in either of these two products. Such data appear in section C (Support General, PCN SG001B503).

b. TCTO compliance man-hours are included in sections A and B.

6. TCTO man-hours are included in the monthly transaction listing, section A (On-Equipment, PCN SG001B501) and section B (Off-Equipment, PCN SG001B502), as well as in the MDCS Work Summary, Part 1 (Direct Labor by End Item, PCN SG001B511). These reports are type-

maintenance oriented and include man-hour expenditures charged to TCTO type maintenance codes T and Z.

7. Abort data. No abort data products or summaries are provided, although abort occurrences are reported.

8. No utilization or status information is included.

9. Other peculiarities/characteristics of the MDCS are as follows:

a. The number of preflights need not relate to number of flights of a serial numbered aircraft. TO 00-20-2-2, paragraph 1-17e, states that support general work by the same crew/individual on the same type of equipment may be combined and documented on the same AFTO form 349 using appropriate units complete, and the serial number of the first items inspected or serviced entered in block 3. Such use of AFTO form 349 is limited to preflight, basic postflight, end of runway checks, and oil samplings for spectrometric analysis.

b. Each TCTO and Time Change Action performed during an inspection will have a peculiar job control number (JCN) assigned.

c. Since documentation procedures for look/fix portions of minor inspections vary, analysis of the data produced must be approached with caution (TO 00-20-2, paragraph 4-2c(3)).

1) For minor inspections (daily, preflight, basic postflight, thruflight, home station check, servicing, shift verification, scheduled storage inspection, and ground CEM calendar inspections with an interval of less than seven days), a JCN is assigned for the "look" phase. Inspections on same day and for the same end items may have same JCN. Each discrepancy discovered during each inspection, however, will have a separate JCN assigned. Consequently, there is no capability to identify the number of discrepancies discoverd for a particular inspection. However, the average discrepancies found per type inspection can be calculated using the WUC for the type inspection and units complete (for number of inspections), and the number of discrepancies (WUCs in 11-97000 series) with the corresponding when discovered code (H for thruflight; J for preflight; 3 for home station check; J for daily inspection/shift verification; E for storage inspection).

2) For phased inspections (hourly and calendar), a single JCN is assigned for the "look" and "fix" phases, except that discrepancies discovered during an inspection and carried forward will each have a distinct last three digits. Since the first four digits of the JCN identify the Julian date (first three digits) and the specific phase inspection (fourth digit — A for 1st phase, Z for 24th phase, 2 for 26th phase), manual or BLIS arrangement of the data can relate the number of discrepancies discovered during a specific phase inspection by aircraft serial number, by similar phase inspections, or as the average for all phase inspections. This documentation practice also permits analysis of discrepancies corrected versus those carried forward.

3) For major inspections, a similar practice is used, i.e., the same JCN is assigned to both the "look" and "fix" portions. The fourth digi identifies the type inspection (similar to phased inspections). The fourth position will be A for periodic inspections or ground CEM calendar inspections of seven days or greater; B for minor isochronals; C for major isochronals; D for hourly postflights. Like phased inspections, different last three digits are used for discrepancies discovered during the inspection and carried forward.

d. Maintenance associated with the following will not be keypunched for MDCS processing:

1) Explosive Ordnance Disposal (EOD) team actions (reconnaissance, identification, rendering safe, disposal)

2) ICBM support general work (includes direct support equipment). For ground CEM maintained by other than the missile maintenance unit, support general work in the 03000 and 04000 series will be processed.

3) Ground CEM support general, except 03000 and 04000 scheduled and special inspections, which will be processed

4) Nuclear weapons

5) Organizational exemptions in TO 00-20-2, attachment 3.

(7) Anomalies Peculiar to DO56.

(a) Computation of mean time between maintenance does not include any support general work, even scheduled and special inspections. Also excluded are cannibalizations, off-equipment repairs, NRTS actions, and action taken codes Q (installation) and Y (troubleshoot) actions. Actions related to tanks, racks, etc., will be included if these items have work unit codes.

(b) Computation of mean time between failure does not include type 2 failures (externally induced), and therefore their effect on operational reliability and their demand on maintenance and supply resources are not recognized.

(c) Action taken code G (repairs and replacements of minor parts) is not used to aggregate failure data below the system/subsystem level. This current DO56 procedure for computing MTBF for components overstates the MTBF value, i.e., makes component reliability appear better than it really is.

(d) The true MTBF value is slightly understated because of delays between the removal of components and completion of bench check for action taken code B events (bench checked serviceable). This occurs because off-equipment action taken code B events are subtracted monthly from

on-equipment action taken codes P and R by matching type equipment, ALC, MDS, WUC, base code, and job control numbers for the on- and off-equipment actions. When a delay occurs there will be no match and the on-equipment action will be recorded as a true failure, thus understating the MTBF to some degree.

(e) MTBF values are not computed and provided for the original weapon system.

(f) Differences between MDCS and DO56 failure definitions are discussed under paragraph 4-5a(6)(a).

(g) In computing man-hours per flying hour, some DO56 reports exclude all support general work unit codes, including 03 (scheduled inspections) and 04 (special inspections). Also excluded are man-hours consumed on items withdrawn from supply (when discovered code Y). The DO56B5025 product is the best source of MH/FH data. However, support general hours are incomplete since only 03XXX and 04XXX WUC data are reported to AFLC.

(h) The DO56B5006 and DO56B5025 include some support general work, but DO56B5527 does not. Further, DO56B5006 includes programmed depot maintenance man-hours in the "shop" column. Depot man-hours are separately shown in the DO56B5025 report. Although the forewords to DO56B5006 and 5025 (dated 31 October 1973 and 1 March 1970, respectively) state otherwise, type maintenance codes for unscheduled man-hours are B, S, and Y for aircraft, and B, E, L, S, W, X, and Y for engines. All other type maintenance codes apply to the scheduled man-hours. Support general WUC 03XXX are scheduled, 04XXX are unscheduled. TCTO labor is shown separately in the DO56B5025 neither as scheduled nor unscheduled.

NOTE: Although not specifically excluded, type maintenance codes J and Q data will not be included because the EQCL codes for this type of work will vary from the weapon system EQCL code to which the DO56B5006 and DO56B5025 apply.

(i) Abort rates as reported on DO56B5015 and 5527 for a weapon system can be overstated since more than one WUC may be reported for a single abort. Also, "number of sorties flown" does not reflect attempted sorties. Total attempted sorties should include sorties flown plus sorties on which a when discovered code A (before flight abort) was reported. This anomaly overstates the abort rate. Neither the DO56B5527 nor the DO56B5006 and DO56B5007 products are satisfactory sources for abort rate data for an overall weapons system. If available, the DO56B5015 products for an overall MDCS may be of some value for comparison purposes of aborts per 1000 sorties.

b. Data Systems Description.

Paragraphs 4-5b(1) through (10) describe data systems applicable to the evaluation of reliability, maintainability, availability, and life cycle costing of Air Force weapon systems and equipment during OT&E. The data systems, which include both data collection and management, are described relative to

their objectives, policy, and procedural documentation; data collection forms and/or data sources; associated automated data system (ADS) output products; and interfaces with other data systems. Where applicable, related appendixes discuss the equations and algorithms used in the respective computer programs to obtain resulting logistics parameters and/or measures of effectiveness such as mean time between failures, man-hours per flight hour, etc. The appendixes also contain samples of the output products. The automated data processing systems discussed include:

- Maintenance Data Collection (MDC) System
- Maintenance Cost System (MCS)
- Aerospace Vehicle and Equipment Inventory, Status, and Utilization Reporting System (AFR 65-110)
- Product Performance System (DO56)
- Increase Reliability of Operational Systems (IROS), KO51
- Engine Management Products (DO24)
- Standard Base Supply System (U1050-II)
- Base Level Inquiry Systems (BLIS)
- Machine Independent System Effectiveness Data System (MISEDS)
- Maintenance Management Information Control System (MMICS).

(1) Maintenance Data Collection (MDC) System.

(a) Objective.

Objectives of the MDC System are to provide a means for collecting, storing, and retrieving base-level maintenance production data for use on the base where the data are collected, and for use off the base by USAF/PRM (manpower), USAF Accounting and Finance, AFLC, and other Major Commands.

1. On base, base managers and supervisors can retrieve data of the following nature:

a. Production information about the type of work accomplished, the work center that performed the job, and the equipment on which the work was accomplished.

b. Equipment maintenance schedules and inventory information for maintenance actions required on a calendar basis.

c. Productive direct labor and productive indirect labor hour expenditures in either detailed or summary form. This includes labor expended to support other organizations or special projects.

d. Equipment failures and discrepancy information. This information is available in composite form by type of equipment and for individual equipment items.

e. Configuration status accounting information concerning modifications that have been completed and those that are partially completed.

2. Off base, the intended use of the data within the MDC System (and composite data from interfaces with other data systems) is for information to control various programs established by Air Force and Major Command regulations and manuals. MDC System data can be used to:

a. Identify maintainability and reliability problems of Air Force equipment.

b. Establish priorities for product improvement actions.

c. Account for modifications to Air Force equipment and evaluate the effectiveness of modifications.

d. Validate inspections and time change requirements and intervals.

e. Identify safety deficiencies and monitor their corrective actions.

f. Validate or adjust calibration intervals.

g. Validate spares requirements.

h. Identify programmed depot maintenance requirements.

i. Compile maintenance man-hours per flying hour data.

j. Evaluate unsatisfactory material reports and modification proposals from other commands or industry.

k. Compute the cost for billing the Military Airlift Command and the Air National Guard for reimbursable depot level maintenance.

l. Determine Time Compliance Technical Order kit distribution requirements and TCTO recision date.

3. Additionally off-base, AFLC provides:

a. In conjunction with AFSC, data on the performance and support requirements of current inventory equipment for industry to use in developing new systems and equipment.

b. Data for reports by Headquarters USAF, the Departments of the Army and Navy, the Inspector General (for accident investigation), and the Major Commands.

c. Data on computer tapes to Major Commands requiring comparable data as used by AFLC.

d. Data on Air Force-wide repair capability to bases, Major Commands, and Headquarters USAF for the assessment and improvement of maintenance repair capabilities.

4. Besides AFLC, the data in the MDC system is intended for other off-base users such as:

a. Major Commands to determine the status of equipment modifications.

b. Headquarters USAF/PRM and Major Commands for validating manpower requirements.

c. Headquarters USAF and the Accounting and Finance Center for determining the cost of base level maintenance operations.

(b) Policy and Procedural Documentation for MDC.

1. AFM 66-1, Maintenance Management. This manual establishes the maintenance management system applicable to all Air Force and Air National Guard activities engaged in the maintenance of aircraft, missiles, munitions, AGE, avionics, training equipment, and CEM equipment. AFM 66-1 contains 12 volumes presenting specific guidance tailored for major functional areas.

2. AFM 66-267, Maintenance Data Collection System. This manual provides the rules for the operation of the MDC System on the B3500 computer. It provides an overview of the entire system, gives initial implementation instructions, and outlines normal day-to-day operations. All output products are described and a sample of each output product is presented in Chapter 5 of AFM 66-267 (reproduced as appendix 4-5A). The use of the Base Level Inquiry System (BLIS) in conjunction with the MDC is described in Chapter 6 of AFM 66-267.

3. AFM 171-267, Automatic Data Processing Systems and Procedures. This manual provides B3500 computer information for processing MDC System data utilizing the G001B/BD Automatic Data System.

4. Technical Order 00-20-2 Series, The Maintenance Data Collection System. The TO 00-20-2 series provides detailed information on the maintenance data collection procedures for on-equipment, off-equipment, and "productive indirect" hours. The series describes in detail how to fill out the associated data collection forms.

(c) Data Collection Forms/Data Sources for MDC System.

1. Data forms: AFTO form 349, "Maintenance Data Collection Record," and the AFTO form 350, "Reparable Item Processing Tag," are the basic data collection source documents used with the MDC System.

a. AFTO form 349 is the single raw data source document used to transcribe data onto keypunched cards for input to the associated ADS. The TO 00-20-2 series describes completely the uses of the AFTO form 349 for each class of equipment and for non-MDC applications.

b. AFTO form 350 serves as the common bond between maintenance and supply. When a demand is made from supply for a replacement repair cycle item, a supply document number is obtained from supply and recorded on the AFTO form 350 (blocks 13, 16). This form interfaces the MDC System with the Standard Base Level Supply System (U1050-II). The TO 00-20-2 series describes in detail the use of AFTO form 350.

(d) Automatic Data Processing System Used by the MDC System.

The ADS associated with the MDC is the Maintenance Data Collection System G001B/BD employed on the B3500 computer. This system provides a series of computer products to assist maintenance managers at the base level. The various output reports provide such information as what jobs were performed by the manpower charged to direct labor in each organization, unit shop, or workcenter; how many direct man-hours were expended on each job; why each repair was required; when each malfunction was discovered, etc. AFM 171-267 provides information for processing the G001B/BD ADS on the B3500 computer.

(e) Output Products and Reports of G001B/BD ADS.

Table 4-5d lists the products of G001B/BD, giving the Product Control Number (PCN), title, and the cross reference to paragraphs in Chapter 5 of AFM 66-267 (reproduced as appendix 4-5A). That chapter provides outlines of the various products, describes their format and use, and explains the equations and algorithms used in the computer program.

TABLE 4-5d. TABLE OF OUTPUT PRODUCTS FROM G001B/BD MAINTENANCE DATA COLLECTION SYSTEM (Sheet 1 of 4)

Product Control Number	Title	Applicable Paragraph, AFM 67-267*
SG001B011	MDC History Change Listing	
SG001B012	MDC History Change Error Listing	
SG001B032	MDC Chief of Maintenance History Transfer Listing	
SG001B033	MDC Chief of Maintenance History Purge Listing	
SG001B121	MDC Master ID Error Listing	5-4
SG001B122	MDC Master ID Update Listing	5-5
SG001B123	MDC Master ID Error Card	5-4
SG001B132	MDC Master ID Request Error Card	5-6
SG001B151	MDC Master ID Listing by ID Number	5-7
SG001B152	MDC Master ID Listing by OWC	5-7
SG001B153	MDC Master ID Listing by End Item	5-7
SG001B154	MDC Master ID Listing by PWC	5-7
SG001B162	MDC Equipment Schedule Part 1 by PWC	5-8a
SG001B163	MDC Equipment Schedule Part 2 by OWC	5-8a
SG001B164	PME General Purpose Cards	5-8c
SG001B172	MDC Organizational Master Record Update Listing	5-9
SG001B181	MDC Master File Invalid Data	5-10a
SG001B183	MDC Master File Invalid Data Add Cards	5-10c
SG001B302	MDC Daily Transaction Error Listing	5-11
SG001B303	MDC Daily Transaction Error Cards	5-11
SG001B304	MDC Schedule Update Listing	5-12

*See appendix 4-5A.

TABLE 4-5d. (Sheet 2 of 4)

Product Control Number	Title	Applicable Paragraph, AFM 67-267*
SG001B321	MDC Daily Transaction Listing Section A (On-Equipment)	5-13c(1)
SG001B322	MDC Daily Transaction Listing Section B (Off-Equipment)	5-13c(2)
SG001B323	MDC Daily Transaction Listing Section C (Support General)	5-13c(3)
SG001B324	MDC Daily Transaction Listing Section D (Indirect Labor)	5-13c(4)
SG001B325	MDC Daily Transaction Listing Section E (Parts Replaced)	5-13c(5)
SG001B326	MDC Daily Transaction Listing Section F (Serially-Controlled and Time Change Remove and Replace)	5-13c(6)
SG001B327	MDC Daily Transaction Listing Section G (Engine Room and Replace)	5-13c(7)
SG001B501	MDC Monthly Transaction Listing Section A (On-Equipment)	5-14a(1)
SG001B502	MDC Monthly Transaction Listing Section B (Off-Equipment)	5-14a(2)
SG001B503	MDC Monthly Transaction Listing Section C (Support General)	5-14a(3)
SG001B504	MDC Monthly Transaction Listing Section D (Indirect Labor)	5-14a(4)
SG001B505	MDC Monthly Transaction Listing Section E (Parts Replaced)	5-14a(5)
SG001B506	MDC Monthly Transaction Listing Section F (Serially-Controlled and Time Change Remove and Replace)	5-14a(6)
SG001B507	MDC Monthly Transaction Listing Section G (Engine Remove and Replace)	5-14a(7)
SG001B511	MDC Work Summary Part 1 (Direct Labor by End Item)	5-15a

TABLE 4-5d. (Sheet 3 of 4)

Product Control Number	Title	Applicable Paragraph, AFM 67-267*
SG001B521	MDC Work Summary Part 2 Section A (Direct Labor by Workcenter, 1 Pos)	5-15b
SG001B522	MDC Work Summary Part 2 Section B (Direct Labor by Workcenter, 2 Pos)	5-15b
SG001B523	MDC Work Summary Part 2 Section C (Direct Labor by Workcenter, 3 Pos)	5-15b
SG001B525	MDC Work Summary Part 2 Section D (Direct Labor by Workcenter, 5 Pos)	5-15b
SG001B531	MDC Work Summary Part 3 Section A (Indirect Labor by Workcenter, 1 Pos)	5-15c
SG001B532	MDC Work Summary Part 3 Section B (Indirect Labor by Workcenter, 2 Pos)	5-15c
SG001B533	MDC Work Summary Part 3 Section C (Indirect Labor by Workcenter, 3 Pos)	5-15c
SG001B535	MDC Work Summary Part 3 Section D (Indirect Labor by Workcenter, 5 Pos)	5-15c
SG001B536	MDC Activity Identifier Summary Part 2 (Indirect Labor)	5-15c
SG001B541	MDC Activity Identifier Summary Part 1 by PWC	5-16a
SG001B542	MDC Activity Identifier Summary Part 2 by Activity Identifier	5-16a
SG001B732	WUC Trend Analysis Report	5-17a
SG001B734	Part Number Trend Analysis Report	5-17b
SG001B735	Trend Analysis Request Error Listing	5-17c
SG001B749	Performance Monitoring Master Change Listing	5-17d
SG001B771	On-Equipment Performance Highlights	5-17e
SG001B772	Off-Equipment Performance Highlights	5-17f
SG001B781	High-25 On-Equipment Failures	5-17g

TABLE 4-5d. (Sheet 4 of 4)

Product Control Number	Title	Applicable Paragraph, AFM 67-267*
SG001B791	High-25 Man-Hour Consuming Jobs	5-17h
SG001B811	Workload Distribution Input Request Error List	5-18a
SG001B812	Workload Distribution Histogram Average Number of Workers by Hour of Day	5-18a
SG001B813	Workload Distribution Histogram Productive Man-Hours by Hour of Day	5-18a
SG001B814	Workload Distribution Histogram Productive Man-Hours by Day of Month	5-18d
SG001B815	Workload Saturation Chart Man-Hours by Hour of Day	5-18e
SG001B816	Workload Saturation Chart Man-Hours by Day of Month	5-18e
RCS:LOG-MA(AR) 7411	MDC Depot Equipment Addition/Deletion List	3-7b(2) (c)

(f) MDC System G001B/BD ADS Interfaces.

The MDC System G001B/BD Automatic Data System interfaces with the DO56 Product Performance System. The DO56 Product Performance System ADS utilizes the B3500 command level computer. The inputs to DO56 include the report RCS: LOG-MMO (AR) 7142 from the Maintenance Data Collection System G001B/BD, which is forwarded to AFLC and MAJCOMs. Subsection 4-5b(4) discusses the DO56 system in detail.

(2) Maintenance Cost System (MCS).

(a) Objectives – Objectives of the Maintenance Cost System are:

1. To provide a cost system for base level activities performing organizational and intermediate maintenance.

2. To permit the consolidation of both depot and base level maintenance costs into one report showing total Air Force maintenance cost.

3. To improve Office of the Secretary of Defense (OSD)/USAF responsiveness to Office of Management of the Budget (OMB) and Congress regarding total maintenance cost.

4. To provide data for life cycle costing.

5. To improve the basis for determining whether to perform maintenance contractually or in-house.

6. To improve data on base level maintenance cost per flying hour.

7. To purify program element reporting for the 5-year force structure and Air Force budget submission.

8. To provide cost controls over total maintenance labor expenditures (direct, indirect, or overtime).

(b) Policy and Procedural Documentation for the Maintenance Cost System.

1. AFM 177-380, USAF Standard Base Level Maintenance Cost System, prescribes standard procedures for reporting at the base level on the maintenance cost systems employed on the B3500 computer. The manual applies to all base level Accounting and Finance Offices (AFOs) whose accounts and Maintenance Data Collection Systems are maintained on the B3500 computer, and where the Standard Base Supply System (SBSS) is maintained on the U1050-II. AFM 177-380 has been developed primarily as a functional user support manual for the MCS.

2. AFM 171-380, Base Level Maintenance Cost System (B3500). AFM 171-380 is the data automation counterpart manual to

AFM 177-380. It provides instructions for data automation personnel to process all of the accounting applications and to provide the output products of the MCS.

(c) Data Collection Forms/Data Sources.

The MCS receives inputs from two classes of source data: punched cards and magnetic tape. The U1050-II SBSS and the engine manager provide MCS information by punched cards. The Maintenance Data Collection System, Maintenance Management Information Control System, and the Accounting and Finance Systems supply MCS information by magnetic tape.

(d) ADP System Employed by MCS.

The Automatic Data System employed by the Maintenance Cost System is the H129/US.

(e) Output Products and Reports of the Base Level Maintenance Cost System (B3500) ADS.

1. The base level MCS reports provide the chief of maintenance with cost data for analysis, isolation, and control of the cost resources consumed in the maintenance operation. The reports are cost (expense) oriented, meaning that the costs are measured by use and consumption of resources rather than by assignment of resources or by obligation of funds. Six reports are produced from the MCS.

2. Table 4-5e provides a listing of the MCS output reports giving the title, report control symbol (RCS), report number, and the reference paragraphs in chapter 15 of AFM 177-380 where a description of the report can be found. Chapter 15 of AFM 177-380 is reproduced as appendix 4-5B.

(f) MCS Interfaces with other ADSs as follows:

1. General Accounting System.

a. The General Accounting System provides cost data to the MCS monthly for each maintenance organization. These costs, such as TDY, contractual service, Contractor Operated Parts Store/Contractor Operated Civil Engineering Store (COPARS/COCESS), and AVGAS non-fly (AVGAS used for other than flight, e.g., engine run-up during maintenance) and programmatically are distributed to Mission Design Series (MDS) on a percentage of direct productive man-hours used.

b. The General Accounting System provides an extract tape which is input to the MCS interface program. The monthly extract tape is produced automatically during end-of-month processing. A listing of the transactions contained on the tape is available as "A&F (Accounting & Finance) Monthly MCS Extract Lists," PCN N3470554.

2. MCS Interface with Maintenance Data Collection System (MDCS) – The MDCS provides the MCS with actual Air Force

TABLE 4-5e. MAINTENANCE COST SYSTEM OUTPUT REPORTS

Report No., RCS HAF-ACF(M)7403	Title	Applicable Paragraph, AFM-177-380*
1A	Organizational and Intermediate Maintenance Cost Report – WBS Within MDS Within PEC	15.4
1B	Organizational and Intermediate Maintenance Cost Report – Non-MDS by WBS	15.5
2A	Organizational and Intermediate Maintenance Cost Report – WAC Within MD Within PEC	15.6
2B	Organizational and Intermediate Maintenance Cost Report – Non-MDS by WAC	15.7
3	Organizational and Intermediate Maintenance Cost Report – by Indirect Productive Labor Category	15.8
4	Organizational and Intermediate Maintenance Cost Report – by Indirect Non-Productive Category	15.9
5	Organizational and Intermediate Maintenance Cost Report – by Material Category	15.10
6	Organizational and Intermediate Maintenance Cost Report – by Customer	15.11

*See appendix 4-5B.

maintenance man-hour data by Mission Design Series (MDS), Workload Breakdown Structure (WBS), Work Accomplished Code (WAC), etc. This information, provided by tape with report control symbol RCS:HAF-MMO(AR) 7142, is input on MCS monthly.

3. MCS Interface with the MMICS Administrative Subsystem/Exception Time Accounting System (ETA) – The MMICS administrative subsystem and the ETA provide the MCS with information relating to available maintenance man-hours. This information is provided on tape each month. (Note: Bases still operating on MMICS increment 1 will report to MCS from the MMICS administrative subsystem.)

4. MCS Interface with MMICS Status Subsystem/Aerospace Vehicle Status Report (A1) – The MMICS Status Subsystem/Aerospace Vehicle Status Report (A1) provides the MCS actual monthly and fiscal year-to-date flying hours by aircraft MDS. The input to MCS is made by tape monthly. (Note: Bases on increment 1 of MMICS report to MCS using the Aerospace Vehicle Status Report (A1). Bases on increment 2 of MMICS report to MCS using the MMICS status subsystem.)

5. MCS Interface with the Standard Base Level Supply System, U1050-II – Daily, the SBSS produces detailed material transaction cards for input to MCS. These transaction cards are processed by the MCS to accumulate both direct (funded and unfunded) and indirect material costs.

6. MCS Inputs from Base Engine Manager – The MCS must provide for costing exchange material consumed while performing maintenance at the installation level. When a reparable investment item (for example, the J79 engine) is sent to AFLC as NRTS, the appropriate aircraft Mission Design Series is charged 20 percent of the stock price list. Exchange material consumed during the repair of an engine is provided through the Standard Base Supply System (SBSS). Since whole engines are not included in the SBSS, they must be controlled and costed based on input from the base engine manager. The base engine manager provides engine detail cards to the MCS manager monthly.

7. MCS Inputs from Base Level Civilian Pay System – The base level civilian pay system provides leave data on civilian personnel assigned to maintenance organizations so that the total leave cost can be entered in the MCS. The method for costing civilian accrued annual leave in the base level MCS requires that computations be made annually from payroll records as of the end of the fiscal year for the amount of change in the unused balance of accrued annual leave. The amount is costed to MDS/non-MDS based on direct labor hours used for that weapon/support system.

(3) Aerospace Vehicle and Equipment Inventory, Status, and Utilization Reporting Systems (AFR 65-110).

(a) Objectives – Objectives of the Aerospace Vehicle and Equipment Inventory, Status and Utilization Reporting System are to provide basic historical management information to all levels of command, and provide indications of equipment capability and performance summarized over a period of time. Specifically, the information contained in the resulting output products is used:

1. To provide the official Air Force inventory (except CEM) and condition status data for the equipment reported.

2. To develop the Air Force programming documents and their related budget and manning requirements.

3. To prepare statistical analyses for congressional committees, the Office of Management and Budget, and the Department of Defense.

4. With the Maintenance Data Collection system in computing mean time between failures and other logistical assessment parameters.

5. As an input to the Aircraft Maintenance Manpower Information Systems.

6. To provide listings of the data input to the Maintenance Cost System.

(b) Policy and Procedural Documentation for the Aerospace Vehicle and Equipment Inventory, Status, and Utilization Reporting System.

1. AFR 65-110, Standard Aerospace Vehicle and Equipment Inventory, Status, and Utilization Reporting. This manual establishes standard requirements for reporting inventory, status, and utilization of selected Air Force aerospace equipment. Specific individual requirements are prescribed for:

a. Aerospace vehicle inventory and status reporting

b. Aircraft utilization reporting

c. CEM status and inventory reporting

d. Trainer equipment inventory, utilization, and status reporting.

2. AFM 65-260, Aerospace Vehicle Inventory, Status, and Utilization Reporting. AFM 65-260, used in conjunction with AFR 65-110, provides the documentation necessary for the functional area personnel being supported by the B-3500, B-362, and H-6000 computers. It contains procedures for establishment and use of the Aerospace Vehicle Inventory, Status, and Utilization Reporting System on the B-263 and B-3500 at base level, and the B-3500 and H-6000 computers at command level. It and chapter 2 of AFR 65-110 pertain to inventory and status reporting. Chapter 3 of AFR 65-110 is used in conjunction with AFM 65-260 for utilization reporting.

3. AFM 171-260, Aerospace Vehicle Status Reporting System G033A/AW (Volumes I and II). This manual provides operating procedures for reporting inventory, status, and utilization of aerospace vehicles to processing organizations, Major Commands, and AFLC on the G033A/AW automatic data system employed on the B-3500 and H-6000 computers.

4. AFM 65-265, Communications - Electronics - Meteorological (CEM) Status Reporting. AFM 65-265 describes and establishes the procedures for the standard CEM Equipment Status and Inventory Reporting System. It contains data processing instructions for the functional managers receiving computer support. Procedures for preparing and submitting Air Force form 2445, "Job Control Document", or Air Force form 182, "Equipment Status Report", are provided. It also provides the standard sample report formats on CEM status reporting at all levels of command.

5. AFM 171-265, Ground CEM Equipment Reporting System, G033E/BB (Volumes I and II). This manual provides operating procedures for reporting status and inventory of ground CEM equipment to processing organizations, Major Commands, and AFLC on the G033E/BB automatic data system employed on the B-3500 base level computer.

6. AFM 65-272, Trainer Equipment, Inventory Utilization and Status Report System – AFM 65-272 contains the necessary documentation and data processing instructions for use by the functional area personnel receiving base level support on the B-3500 and B-263 computer system. It establishes the procedures and standards necessary for preparing and submitting Air Force form 359 for processing, and provides input formats and descriptions of output products.

7. AFM 171-272, Trainer Equipment, Inventory Utilization and Status Reporting System (B-3500) G033G/B1 (Volumes I and II). This manual provides operating procedures for reporting inventory, status, and utilization of selected trainers/training equipment to processing organizations, and AFLC. The ADS described is the G033G/B1, employed on the B-3500 computer.

(c) Data Collection Forms and Data Sources.

1. Data Collection Forms.

a. Air Force form 359, "Aerospace Vehicle Data, Card",* is used to record utilization and changes in status and inventory of aerospace vehicles on a daily basis at each unit supported by a base processing a B-3500 computer. This form is also used for the recording of utilization, status, and inventory change of trainer equipment.

b. Air Force form 359a, "Aerospace Vehicle Data Manual",* is used when manual reporting is required, i.e., the base/unit is not supported by a B-3500 computer. These source documents are subsequently forwarded to a designated supporting activity in accordance with AFR 11-4.

c. AFTO form 781 series, "Aerospace Vehicle Flight Data Document", contains the source documents for recording and reporting operational flight information for each aircraft that participates in a flying mission. The information contained on AFTO form 781 series is transcribed onto prepunched Air Force form 359 cards for subsequent processing.

d. Prepunched Air Force form 359, used in conjunction with AFTO form 781, contains the serial number, PDS, organization number, kind and type, command code, CONUS/overseas, status, and work assignment status codes.

e. Air Force Form 2445, "Job Control Document", is the primary source document for CEM status/inventory reporting.

2. Data Sources: – In addition to the raw data obtained from the data collection forms discussed in the preceding paragraphs, the Aerospace Vehicle Inventory Status and Utilization Reporting System uses input from the Maintenance Cost System (MCS) in producing the RCS:LGY(D)7140 reports.

*Note: AF Forms 359 and 359a will become obsolete when Increment 2 of MMICS is implemented. Data will be input directly via remote terminals.

These reports (output products) contain inventory, status, and utilization data for the aircraft possessed each day, and also contain the month-to-date totals.

(d) Automatic Data Systems Associated with the Aerospace Vehicle and Equipment Inventory, Status, and Utilization Reporting System (AFR 65-110).

1. G033A/AW, "Aerospace Vehicle Status Reporting System." This system is used for reporting inventory, status, and utilization of aerospace vehicles to possessing organizations, Major Commands, and AFLC. AFM 65-260 and AFM 171-260, Volumes I and II, describe the system operation and output products.

2. G033G/B1, "Trainer Equipment, Inventory, Utilization, and Status Reporting System." This system is used for reporting inventory, status, and utilization of selected trainers/training equipment to possessing organizations, and AFLC. AFM 65-272 and AFM 171-272, Volumes I and II, describe the system operation and output products.

3. G033E, "Communications - Electronics - Meteorological (CEM) Equipment Status and Inventory Reporting System." This system is used for reporting status and inventory of CEM equipment. AFM 65-265 describes the system operation and output products.

(e) Output Products and Reports of the ADSs Associated with the Aerospace Vehicle and Equipment Inventory, Status, and Utilization Reporting System (AFR 65-110).

Table 4-5f lists the output products from the three ADSs associated with AFR 65-110. This table lists the PCN, title of product, and the page/paragraph of the AFM where a description of the report can be found. Appendix 4-5C contains reproductions of the specific chapters of AFMs 65-260, 65-265, and 65-272 which provide complete descriptions of the output products, samples of the reports, and discussions of the equations/algorithms used in the computer programs.

(4) Product Performance System (DO56).

(a) Objective – The objective of the DO56 Product Performance System is to accumulate and display all available failure information on specific end items, by weapon systems and components.

(b) Policy and Procedural Documentation for DO56.

1. AFLCM 171-45, Product Performance System (DO56). AFLCM 171-45 defines the procedures necessary for the operation of the Product Performance System.

2. AFLCR 66-15. Product Performance. AFLCR 66-15 contains policies, requirements for data system maintenance, and procedures governing the utilization and analysis of deficiency data reported on Air Force systems and equipment.

TABLE 4-5f. OUTPUT PRODUCTS OF AEROSPACE VEHICLE INVENTORY, STATUS, AND UTILIZATION REPORTING SYSTEM (AFR 65-110) (Sheet 1 of 3)

Product Control Number	Title	Ref. Document	Page/ Paragraph
A. G033A OUTPUT PRODUCTS			
N260001 N260002	Aerospace Vehicle Audit/Error Inventory List	AFM 65-260	3-1/3-2
N260006	Aircraft Reported to AFLC and MAJCOM Report		3-5/3-3
N260007	Aerospace Vehicle Status Report		3-5/3-4
N260008	Aerospace Vehicle Status Distribution Report		3-5/3-5
N260009	Aerospace Vehicle WUC Report		3-5/3-6
N260010	Aerospace Vehicle Flying Report		3-5/3-7
N260011	Aerospace Vehicle MCS Summary Report		3-5/3-8
GGB070A	80/80 List of Duplicate Transactions		3-5/3-9a
GGB7F04	Aerospace Vehicle Status Report by MDS		3-5/3-9b
GGB7F0B	Aerospace Vehicle Status Report by Sub-Command/Numbered Air Force		3-5/3-9c
GGBDF0A	Top 10 Unscheduled Items NOR		3-5/3-9d
GGBDF0B	Top 25 Unscheduled Items NOR		3-5/3-9e
G0J3F0A	Monthly Summary of Unscheduled Items NOR		3-5/3-9f
GGJF0B	Aerospace Inventory by MDS		3-6/3-9g
GGX1F0A	Inventory Changes and Errors		3-6/3-9h
GGX2F0A	Inventory by Assigned Organization		3-6/3-9i
GGX3F0A	Work Unit Code Change List		3-6/3-9j
GGX3F0B	Work Unit Code Master List		3-6/3-9k
GGBF0A	Audit/Error List	AFM 65-260	3-6/3-9l

TABLE 4-5f. (Sheet 2 of 3)

Product Control Number	Title	Ref. Document	Page/ Paragraph
	A. (Cont)		
GGBF0B	Inventory Change List	AFM 65-260	3-7/3-9m
GGBHF0C	Non-Processed Error List		3-7/3-9n
GGJ7F0A	Aircraft Inventory		3-7/3-9o
GGJBF0A	Aerospace Vehicle Flying Report	AFM 65-260	3-7/3-9p
	B. G033E OUTPUT PRODUCTS		
22014A	CEM Edit List (for B263 Computer Only)	AFM 65-265	3-1/3-2a
N265002	Daily CEM Detail Card List		3-1/3-2b(1)
N265007	Daily Detail Status (Open Incidents Only)		3-1/3-2b(2)
N265008	CEM Master Inventory by Organization		3-1/3-2b(3)
*H800/200 / H6000	*Note: H6000 products are the same as H800/200 computer products except for PCN number. Both PCN numbers are shown as H800/200/ H6000.		
23101A / GGA2F0A	80/80 List of Duplicate Transactions		3-2/3-2c(1)
23105A / GGA4F0A	Daily CEM Detail Card Edit		3-2/3-2c(2)
23110A / GGA6F0A	Daily Detail Status (Open Incidents Only)		3-2/3-2c(3)
23115A / GG11F0A	Command CEM Equipment Status Report (RCS: HAF-LGY (M) 7152)		3-2/3-2c(4)
23125A / GG15F0CA	Monthly WUC Summary		3-2/3-2c(5)
23130A / GG17F0EA	Monthly CEM Detailed ESR Listing by TMS	AFM 65-265	3-2/3-2c(6)

TABLE 4-5f. (Sheet 3 of 3)

Product Control Number	Title	Ref. Document	Page/ Paragraph
B. (Cont)			
23135A / GG19F0EA	Monthly CEM Detailed ESR Listing by Organization	AFM 65-265	3-3/3-2c(7)
23140A / GGIAF0DA	Monthly CEM Master Inventory by TMS		3-3/3-2c(8)
23145A / GGICF0EA	Monthly CEM Master Inventory by Organization		3-3/3-2c(9)
23146A / GGIEF0CA	TMS Totals by Sub-Command		3-3/3-2c(10)
23150A / GGIKF0CA	Monthly WUC Summary – Supply Delays		3-3/3-2c(11)
23165A / GGTIF0BA	End Item Summary by TMS		3-3/3-2c(12)
RCS:HAF-LGY(M)7152	AFLC Summary Tape	AFM 65-265	3-3/3-2c-(13)
C. G033G OUTPUT PRODUCTS			
272001	B-3500 Trainer Equipment Fdit Listing	AFM 65-272	3-1/3-2
N272003	B-3500 Monthly Base Level Trainer Status Summary Report		3-2/3-3
N272002	B-3500 Replenishment Cards		3-2/3-4
N272004	B-3500 Error Cards		3-3/3-5
22401A	B-263 Trainer Equipment Edit Listing		3-3/3-6
22403A	B-263 Monthly Base Level Trainer Status Summary Report	AFM 65-272	3-3/3-7

(c) Data Sources for DO56.

1. Maintenance Data Collection System (G001B) provides the AFM 66-1 maintenance data generated by the bases. The data is transmitted to AFLC from throughout the world by AUTODIN, and by mail in the form of magnetic tape and punched card decks bearing report control symbol (RCS) LOG-MMO-(AR)7142. G001B is discussed in para. 4-5b(1).

2. Aerospace Vehicle Inventory and Inventory Change Reporting (G033) provides air vehicle operating data by hours flown, landings, sorties, and inventory. G033 is discussed in para. 4-5b(3).

3. Master Item Identification Control System (MIICS), (DO43), provides an inventory data base of Air Force supply items by stock and part number which is used to identify and verify AFM 66-1 transactions.

4. Master Cross Reference File – Stock Control Data (D143B) provides equipment specialist and division manager codes for the DO56C C4 master.

5. Other related hard copy is input in the form of punched cards, annotated DO56 reports, and AF form 1530 which provides master file update information and system report requests.

(d) Automated Data Processing Systems of DO56 – The DO56 Product Performance System consists of five processing segments (subsystems), as follows:

1. DO56A, "Edit and Error Analysis." The DO56A subsystem is the point of input for the bulk of the transactions processed. All of the AFM 66-1 data (RCS:LOG-MMO(AR)7142) receive a comprehensive edit in accordance with the procedures outlined in Technical Order 00-20-2-11. Transactions that do not pass the edit are counted and displayed on reports which are returned to the initiator for correction and resubmission. These reports include RCS:LOG-MMO(M)7162, "Error Analysis Summary", and LOG-MMO (AR)7163, "Error Detail Listing". Transactions that pass the edit are separated into subject matter groups, and routed into the other subsystems of DO56 or to other interfacing data systems.

2. DO56B, "On Equipment Analysis." The DO56B subsystem receives AFM 66-1 data (RCS:LOG-MMO(AR)7142) that are related to the end piece of equipment by WUC and have been identified as on-equipment records by DO56A. In addition, data are received from *Aircraft Incident/* Emergency Unsatisfactory Report, and from the AFR 65-110 (GO33) system. The resulting reports provide a variety of management decision-making aids. The on-equipment data are maintained on DO56B files for 12 calendar months from date of receipt.

3. DO56C, "Off-Equipment Analysis." The DO56C subsystem receives AFM 66-1 data (RCS: LOG-MMO(AR)7142) that has been identified as off-equipment records by DO56A. In addition, it processes the

Master Item Identification Control System file to pick up associated data. Processing within this subsystem is usually by Federal stock class and item part number. Within DO56C, two processing segments may be accomplished independently: NRTS and PME reports.

4. DO56E, "AFM 66-1 Maintenance Data to Contractor." The DO56E subsystem processes the on-equipment and off-equipment tapes from DO56A, and segregates product information for authorized contractors. The output, in tape form, is mailed monthly to the interested contractor, providing a direct interface between DO56 and the data system operated or subscribed to by the contractor. In addition, the following are forwarded to ALCs in support of contractual studies:

a. Aircraft Accident Emergency Unsatisfactory Reports.

b. On-Equipment Product Performance B4 Master Record. A B4 master record is prepared and maintained for each end article of equipment on which MDC system on-equipment maintenance data reports from the DO56B subsystems are required.

c. Off-Equipment Product Performance C4 Master Records. C4 master records on most items are prepared automatically (using cataloging data from the MIICS file) within the computer of AFLC. C4 master records are prepared and maintained for each item on which off-equipment maintenance data reports from the DO56C subsystems are required.

d. On-Equipment Data.

5. DO56F, "Master Records and Demand Requests by IM/SM." The DO56F subsystem provides a means for the System Manager and Item Manager to update the DO56B and DO56C master files and to request DO56B and DO56C products.

(e) Table 4-5g contains a list of the output products available from the DO56 subsystems. The table lists the new report control symbol, title, and reference paragraph in AFLCR 66-15 where a brief description of the report can be found. Table 4-5h contains a cross reference to the old and new RCS and the PCN. Appendix 4-5D provides detailed descriptions of the output reports.

(f) DO56 Product Interfaces.

The DO56 system provides data for input into other computer systems, as follows:

1. Standard Configuration Management System (SCMS), DO47

2. Advanced Configuration Management System (ACMS), DO57G

TABLE 4-5g. OUTPUT PRODUCTS OF PRODUCT PERFORMANCE SYSTEM (DO56) (Sheet 1 of 4)

RCS No.	Title	Ref. Para., AFLCR 66-15	For "Foreword", See App. 4-5D, Attachment:
	A. DO56 SYSTEM EVALUATION REPORTS		
LOG-MMO(AR)7160	Component Discrepancy Report	4-3a	
LOG-MMO(W)7161	Transmittal Data Log	4-3b	
LOG-MMO(M)7162	Error Analysis Summary	4-3c	
LOG-MMO(AR)7163	Error Detail Listing (TO 00-20-11)	4-3d	
LOG-MMO(M)7164	Card, Count, Actions, and Manhours	4-3e	
	B. MDS WEAPON-ORIENTED REPORTS		
LOG-MMO(AR)7165	B4 Master Record Printout B1/B4/B6 Master Record Edit	5-5a	
LOG-MMO(AR)7166	Selected Work Unit Code Identifier	5-5b	
LOG-MMO(AR)7167	Detail Maintenance Actions for Selected Work Unit Codes	5-5c	10
LOG-MMO(AR)7168	Detail Shop Actions for Selected Work Unit Codes and/or Parts Replaced During Repair	5-5d	11
LOG-MMO(AR)7169	Summarized Maintenance Actions for Selected Work Unit Codes	5-5e	
LOG-MMO(AR)7170	Maintenance Actions, Man-Hours, and Aborts by Work Unit Code	5-5f	1
LOG-MMO(AR)7171	Aborts and Degraded Alerts	5-5g	
LOG-MMO(AR)7172	Unidentified Work Unit Codes	5-5h	

TABLE 4-5g. (Sheet 2 of 4)

RCS No.	Title	Ref. Para., AFLCR 66-15	For "Foreword", See App. 4-5D, Attachment:
	B. (Cont)		
LOG-MMO(AR)7173	Inspection Interval	5-5i	2
LOG-MMO(AR)7174	Inspection Occurrence Interval	5-5j	3
LOG-MMO(AR)7175	Replacement Interval	5-5k	
LOG-MMO(AR)7177	Serial Number and Base Inventory	5-5l	
LOG-MMO(M)7178	Material Safety Deficiency Report	5-5m	4
LOG-MMO(AR)7179	Work Unit Code Corrosion Summary	5-5n	5
LOG-MMO(AR)7180	System and Subsystem Corrosion Summary	5-5o	6
LOG-MMO(AR)7182	AFM 66-1 Code Usage Report	5-2b	
LOG-MMO(AR)7183	System, Subsystem, Work Unit Code Failure Summary	5-5g	7
LOG-MMO(AR)7184	Failure Rate Data for Selected Work Unit Codes	5-5r	8
LOG-MMO(AR)7185	Maintenance Man-Hours per Flying Hour by Weapon, Command System	5-5s	9
LOG-MMO(M)7186	Unidentified Work Unit Codes by Command and Base	5-2b	
LOG-MM(AR)7305	Work Unit Code Usage Report	5-5p	
LOG-MMO(AR)7220	Maintainability/Reliability Summary	5-5t	12

TABLE 4-5g. (Sheet 3 of 4)

RCS No.	Title	Ref. Para., AFLCR 66-15	For "Foreword", See App. 4-5D, Attachment:
C. ITEM ORIENTED REPORTS			
LOG-MMO(AR)7187	C4 Master Record Printout C1/C4 Master Record Edit	5-7a	
LOG-MMO(AR)7188	Selected Part Number Action Summary	5-7b	15
LOG-MMO(AR)7189	Maintenance Actions for Selected FIIN Numbers	5-7c	16
LOG-MMO(AR)7190	Parts Replaced During Field or Depot Repair	5-7d	17
LOG-MMO(AR)7191	Bit and Piece Replacement Summary	5-7e	22
LOG-MMO(AR)7192	Overhaul Quality and Storage Condition	5-7f	
LOG-MMO(Q)7193	USAF Command NRTS and Repaired Summary	5-2c	19
LOG-MMO(Q)7194	Base NRTS and Repaired Summary	5-2d	20
LOG-MMO(AR)7195	Maintenance Reparable Processing Summary	5-7g	18
LOG-MMO(AR)7196	P1/P4 Record Printout	7-19a	
LOG-MMO(AR)7197	Unidentified PME Work Unit Codes	7-19b	
LOG-MMO(SA)7198	PME Calibration Intervals	7-19c	
LOG-MMO(M)7199	Exchangeable Item Listing	5-7h	
LOG-MMO(M)71100	Exchangeable Item Summary	5-5v	
LOG-MMO(AR)71101	AF Wide Base Level Repair-SM	5-5w	
LOG-MMO(M)71102	Unmatched FSN/Part Numbers	5-7i	

TABLE 4-5g. (Sheet 4 of 4)

RCS No.	Title	Ref. Para., AFLCR 66-15	For "Foreword", See App. 4-5D, Attachment:
C. (Cont)			
LOG-MMO(Q)71103	Equipment NRTS and Repaired Summary	5-5x	21
LOG-MMO(Q)71104	Command Invalid NRTS 1 Items	5-2e	
LOG-MMO(SA)71105	Summary of PME Maintenance Actions	7-19e	23
LOG-MMO(SA)71106	PME Calibration Interval Analysis	7-19d	24
LOG-MMO(M)71107	Command Unmatched FSC/Part Numbers	5-2f	
LOG-MMO(M)71108	Exchangeable Items Unmatched Parts Numbers	5-7j	
LOG-MMO(SA)71109	NRTS Code 1 Validation Report	5-7k	
LOG-MMO(SA)71110	Duplicated Part Numbers Within FSC	5-7l	
LOG-MM(Q)7510	Cannibalization Actions, Command Summary	None	13
LOG-MM(Q)7509	Cannibalization Actions, by Weapon System	None	14

TABLE 4-5h. CROSS-REFERENCE LISTING OF RCS (OLD), RCS (NEW), AND PCN (NEW) FOR DO56 OUTPUT PRODUCTS (Sheet 1 of 2)

New PCN	Old RCS	New RCS
DO56A1201	1-LOG-K260	LOG-MMO(AR)7160
DO56A1202	2-LOG-K260	LOG-MMO(W)7161
DO56A1203	3-LOG-K260	LOG-MMO(M)7162
DO56A1204	4-LOG-K260	LOG-MMO(AR)7163
DO56A1205	5-LOG-K260	LOG-MMO(M)7164
Maintenance Action Detail Cards from AF Bases	1-LOG-K97	LOG-MMO(AR)7142
DO56B1501 PRINTOUT	1-LOG-K261	LOG-MMO(AR)7165
DO56B15A1 EDIT		
DO56B5002	2-LOG-K261	LOG-MMO(AR)7166
DO56B5503	3-LOG-K261	LOG-MMO(AR)7167
DO56B5504	4-LOG-K261	LOG-MMO(AR)7168
DO56B5505	5-LOG-K261	LOG-MMO(AR)7169
DO56B5006	6-LOG-K261	LOG-MMO(AR)7170
DO56B5007	7-LOG-K261	LOG-MMO(AR)7171
DO56B5008	8-LOG-K261	LOG-MMO(AR)7172
DO56B5010	10-LOG-K261	LOG-MMO(AR)7173
DO56B5011	11-LOG-K261	LOG-MMO(AR)7174
DO56B5012	12-LOG-K261	LOG-MMO(AR)7175
DO56B5014	14-LOG-K261	LOG-MMO(AR)7177
DO56B5015	15-LOG-K261	LOG-MMO(M)7178
DO56B5016	16-LOG-K261	LOG-MMO(AR)7179
DO56B5017	17-LOG-K261	LOG-MMO(AR)7180
DO56B5020	20-LOG-K261	LOG-MMO(AR)7305
DO56B6521	21-LOG-K261	LOG-MMO(AR)7182
DO56B5522	22-LOG-K261	LOG-MMO(AR)7183
DO56B5023	23-LOG-K261	LOG-MMO(AR)7184
DO56B5025	25-LOG-K261	LOG-MMO(AR)7185
DO56B6526	26-LOG-K261	LOG-MMO(M)7186
DO56B5527	–	LOG-MMO(AR)7220

TABLE 4-5h. (Sheet 2 of 2)

New PCN	Old RCS	New RCS
DO56C4401 PRINTOUT	1-LOG-K262	LOG-MMO(AR)7187
DO56C3401 EDIT		
DO56C4402	2-LOG-K262	LOG-MMO(AR)7188
DO56C4403	3-LOG-K262	LOG-MMO(AR)7189
DO56C4404	4-LOG-K262	LOG-MMO(AR)7190
DO56C5605	5-LOG-K262	LOG-MMO(AR)7191
DO56C4407	7-LOG-K262	LOG-MMO(AR)7192
DO56C5009	9-LOG-K262	LOG-MMO(Q)7193
DO56C5010	10-LOG-K262	LOG-MMO(Q)7194
DO56C4417	17-LOG-K262	LOG-MMO(AR)7195
DO56C5718	18-LOG-K262	LOG-MMO(AR)7196
DO56C5719	19-LOG-K262	LOG-MMO(AR)7197
DO56C5920	20-LOG-K262	LOG-MMO(SA)7198
DO56C5021	21-LOG-K262	LOG-MMO(M)7199
DO56C5022	22-LOG-K262	LOG-MMO(M)71100
DO56C5024	24-LOG-K262	LOG-MMO(AR)71101
DO56C3226	26-LOG-K262	LOG-MMO(M)71102
DO56C5027	27-LOG-K262	LOG-MMO(Q)71103
DO56C5028	28-LOG-K262	LOG-MMO(Q)71104
DO56C5929	29-LOG-K262	LOG-MMO(SA)71105
DO56C5930	30-LOG-K262	LOG-MMO(SA)71106
DO56C3231	31-LOG-K262	LOG-MMO(M)71107
DO56C3232	32-LOG-K262	LOG-MMO(M)71108
DO56C5033	33-LOG-K262	LOG-MMO(SA)71109
DO56C3234	34-LOG-K262	LOG-MMO(SA)71110

3. Commodity Configuration Management System, DO66

4. Aerospace Vehicle Status Reporting System, G033A

5. Engine Configuration Management System (ECMS), DO24I

6. Space and Missile System Organization (SAMSO)

7. Military Airlift Command (MAC)

8. Air Force Communication Service (AFCS)

9. USAF Security Service (USAFSS)

10. Tire Improved Reliability Evaluation System, G011 at OOALC

11. Weapon System Reliability Mathematical Model Program, KO51 at SMALC

12. Air Defense Command (ADC)

13. Flight Safety Prediction Technique, G095

14. *Contractor data in tape form to approved contractors who have requested information on their products.*

(5) Increase Reliability of Operational Systems (KO51).

(a) Objectives.

Objectives of the Increase Reliability of Operational Systems (IROS) Program are to identify those subsystems, components, and items of equipment that are disproportionate consumers of resources, high contributors to system nonavailability, or potential safety problems based on their reliability or maintainability performance. IROS has been designed to quantitatively assess, predict and improve the effectiveness of weapon or support systems by:

1. Measuring and tracking the performance, reliability, maintainability, safety, and logistic support costs of items.* IROS-generated cost data include depot and field maintenance costs of the following nature:

a. Field and organizational maintenance

b. Specialized repair activity

*This summary is extracted from a report prepared for the Air Force Project Rand, titled An Appraisal of Logistics Support Costs Used in the Air Force IROS Program, Report R-1569-PR, February 1975.

c. Packaging and shipping

d. Condemnation costs

e. Base materiel

It does not, however, at the present time, include such costs as:

a. AGE maintenance

b. POL

c. TCTOs

d. Pipeline spares

e. Technical training

f. Systems management

g. Initial spares.

(b) Policy and Procedural Documentation for IROS.

1. IROS is implemented in accordance with the following regulations:

a. AFR 400-46, Increase Reliability of Operational System (IROS) Program, 18 March 1965.

b. AFLCR 400-16, AFLC Increase Reliability of Operational Systems (IROS) Program, 18 January 1974.

2. Revisions to existing publications (e.g., AFM 66-18, AFLCM 171-229) are currently in process to fully document the latest version of the IROS model, its associated program equations/algorithms, and output products. Until these revised documents are available, personal contact with AFLC/MMO personnel at Wright Patterson Air Force Base will be necessary to supplement the information contained in this document.

(c) Data Sources.

The following data systems provide input to the IROS Program:

1. DO43 Cataloging Data

2. G0 33 Aerospace Vehicle Inventory and Equipment Status Report

3. G098 PDM Interval Analysis

4. DO56 Product Performance System

5. DO24I Engine Configuration Management System

6. D143 Management Division and Technician Identification

7. G011 Tire Improved Reliability Evaluation

8. G081 Lockheed C5A MADARS/Ground Processing Systems.

(d) Output Products.

Table 4-5i contains a listing of IROS (KO51) output products. Appendix 4-5E contains the equations/algorithms and samples of the output products.

(6) Selective Management of Propulsion Units (Engine Status Reporting) DO24.

(a) Objectives.

The basic objective of the engine reporting system is to provide management with information needed for allocation of funds, procurements, computation of overhaul requirements, engine inventory and distribution, determining spare engine requirements and disposal, and preparing budget estimates. Intermediate objectives are to maintain an accurate and timely engine inventory, reduce pipeline time, expedite transportation, reduce overhaul time, extend field maintenance capabilities and, in general, streamline engine management techniques.

(b) Policy and Procedural Documentation.

AFM 400-1, Volumes I and II, Selective Management of Propulsion Units, 31 October 1968, provides the general information, assigned responsibilities, reporting information and instructions for implementing engine status reporting and processing the DO24 output products.

(c) Data Collection Forms/Data Sources.

AF form 1534, "Engine Status Report," is the source document used for data collection and subsequent data input to the DO24 Automatic Data System.

(d) Output Products of DO24 Data Collection System.

Table 4-5j lists the engine management products available from DO24. Brief descriptions of selected output products follow table 4-5j.

TABLE 4-51. IROS OUTPUT PRODUCTS

RCS/PCN	Title
RCS: LOG-MM(Q)7372	
KO51. YR1L	System Effectiveness Report, Parts I and II
RCS: LOG-MMO(Q)7213	
KO51. PW5L	Logistic Support Cost Ranking, Selected Equipment Work Unit Codes
KO51. PN1L	Logistic Support Cost Ranking, Selected Items
KO51. PN3L	Logistic Support Cost Ranking, Work Unit Code Status
KO51. PN4L	Logistic Support Cost Breakdown, Current Quarter Computation
KO51. PN6L	Logistic Support Cost Ranking, National Stock Number Status
RCS: LOG-MMO(Q)7215	
KO51. PN7L	Maintenance Action Summary
KO51. PN8L	Logistic Support Cost File Maintenance Register
RCS: LOG-MMO(Q)7213	
KO51. PW2L	Logistic Support Cost Ranking, Item Manager National Stock Number Status
KO51. PW3L	Logistic Support Cost Ranking High Burner Work Unit Codes
KO51. PW4L	Logistic Support Cost Ranking, Weapon System Correction
KO51. PZ1L	Logistic Support Cost Ranking, Ground CEM Equipment
RCS: LOG-MMO(Q)7216	
KO51. YN1L	System Availability Model, Selected Equipment Work Unit Codes
KO51. YN3M	System Availability Model, Work Unit Code Status
KO51. YN4M	System Availability Model, Work Unit Code Computation Data
KO51. YN5M	System Availability Model, Aircraft Status
KO51. YN6M	System Availability Model, Aircraft Computation Data
RCS: LOG-MM(Q)7372	
KO51. YR1L	System Effectiveness Report

TABLE 4-5j. ENGINE MANAGEMENT PRODUCTS, DO24 DATA COLLECTION SYSTEM (Sheet 1 of 6)

Product Control Number	Report Control Symbol	Title
DO24ACN3A		Engine Manager Data List, Parts 1-5
DO24ADN1A	LOG-MMP(M)7201	Error Variance Analysis, Part I - By CMD, Sta, Seq. No.
DO24ADN1A	LOG-MMP(M)7201	Error Variance Analysis, Part II - By CMD, Sta, Error Code
DO24ADN1A	LOG-MMP(M)7201	Error Variance Analysis, Part III - By CMD
DO24ADN2A	LOG-MMP(M)7201	Error Variance Analysis, Part IV - Recap
DO24ADN3A	LOG-MMP(M)7201	Error Variance Analysis, Part V - W/W Recap by CMD
DO24ADN4A	LOG-MMP(M)7201	Error Variance Analysis, Part VI - Prev. Error Variance Pct.
DO24ADN4A	LOG-MMP(M)7201	Error Variance Analysis, Part VII - W/W Pct. by Error Var. Code
DO24ADU1A	LOG-MMP(M)7202	AGE of Data, Part I - By CMD, Sta
DO24ADU2A	LOG-MMP(M)7202	AGE of Data, Part II - By CMD, Sta
DO24ADU3A	LOG-MMP(M)7202	AGE of Data, Part III - W/W by CMD
DO24AEH1A	LOG-MMP(Q)7101	Propulsion Unit Operating Time and Reconciliation Report, Part I —Quarterly Operating Time Listing
DO24AEH1A	LOG-MMP(Q)7101	Propulsion Unit Operating Time and Reconciliation Report, Part II — Reconciliation Listing
DO24ALT1S		Max Time - Transfer Time Removals, Part I
DO24ALT2S		Max Time - Transfer Time Removals, Part II
DO24ALT3S		Max Time - Transfer Time Removals, Part III
DO24BAH1S	LOG-MMP(SA)7233	Cumulative Engine Losses
DO24BAH1T	LOG-MMP(SA)7234	Engine Item ALC - Propulsion Unit Cumulative Serialized Loss Report
DO24BAL1D		OCALC Initial Report Showing Major Overhaul Required
DO24BAU1D		Tinker AFB Shipment/Receipt Report
DO24BAU2D		EIM OCALC Shipment/Receipt Report
DO24BBE1W		ENORS Uninstalled Engine Status Report Summary by Command
DO24BBE2W		ENORS Command History
DO24BBE3W		ENORS Command Comparison

TABLE 4-5j. (Sheet 2 of 6)

Product Control Number	Report Control Symbol	Title
DO24BBJ1W	LOG-MMP(M)7212	ENORS Uninstalled Engine Status Report, Family Group
DO24BBN1W		ENORS Uninstalled Engine Status Report, Type
DO24BBR1W		ENORS Uninstalled Engine Status Report, Serial Number
DO24BCD1M	LOG-MMP(M)7220	Propulsion Unit Reparable Report (EIM OCALC)
DO24BCD2M	LOG-MMP(M)7331	Propulsion Unit Reparable Report (EIM SAALC)
DO24BCD3M	LOG-MMP(M)7331	Propulsion Unit Reparable Report (Other EIMs)
DO24BCF1M	LOG-MMP(M)7222	Propulsion Unit Reparable Report (CMD)
DO24BCF2M	LOG-MMP(M)7223	Propulsion Unit Reparable Report (PACAF)
DO24BCU1M		Southeast Asia Overhaul Report
DO24BDT1O	LOG-MMP(SA)7235	Propulsion Unit Inventory - Monetary Summary, Part I, Family Group
DO24BDT1O	LOG-MMP(SA)7235	Propulsion Unit Inventory - Monetary Summary, Part II, All Accts by FSC
DO24BDT1O	LOG-MMP(SA)7235	Propulsion Unit Inventory - Monetary Summary, Part III, AF Accts by Family Group
DO24BDT1O	LOG-MMP(SA)7235	Propulsion Unit Inventory - Monetary Summary, Part IV, AF Accts by FSC
DO24BDT1O	LOG-MMP(SA)7235	Propulsion Unit Inventory - Monetary Summary, Part V, Non-AF Accts by Family Group
DO24BDT1O	LOG-MMP(SA)7235	Propulsion Unit Inventory - Monetary Summary, Part VI, Non-AF Accts by FSC
DO24BEE1M	LOG-MMP(M)7206	Propulsion Unit Inventory - W/W By Type, Classification, Model, Part I
DO24BEE2M	LOG-MMP(M)7206	Propulsion Unit Inventory - W/W By Type, Model, Family Group, Series, All Accts, Part II
DO24BEE3M	LOG-MMP(M)7206	Propulsion Unit Inventory - W/W By Type, Model, Family Group, Series, All Accts, Part III
DO24BEE4M	LOG-MMP(M)7206	Propulsion Unit Inventory - W/W, Part IV (Zone of INT)
DO24BEE5M	LOG-MMP(M)7206	Propulsion Unit Inventory - W/W, Part V (Overseas)
DO24BEE6M	LOG-MMP(M)7206	Propulsion Unit Inventory - W/W, Part VI (Accounts)
DO24BEG1M	LOG-MMP(M)7225	Propulsion Unit Serialized AF Loss, AF Gain, Modification, Non-AF Loss, Non-AF Gain, Parts I-V

TABLE 4-5j. (Sheet 3 of 6)

Product Control Number	Report Control Symbol	Title
DO24BEK1M	LOG-MMP(M)7226	ALC/EIM Propulsion Unit Serialized by Item Manager
DO24BEM1M	LOG-MMP(M)7227	Propulsion Unit Serialized Distribution and Status Report, All ALCs By Command
DO24BEP1M	LOG-MMP(M)7228	Propulsion Unit Serialized Distribution and Status Report, All ALCs By Command
DO24BEY1M	LOG-MMP(M)7236	OOALC Engines Serviceable 90 Days or More
DO24BFJ1N	LOG-MMP(M)7214	Propulsion Unit Distribution Summary, By Command, Family Group, Station, Engine Designation: (Part I)
DO24BFJ1N	LOG-MMP(M)7214	Propulsion Unit Distribution Summary, By Command, Family Group, Theater: (Part II)
DO24BFL1N	LOG-MMP(M)7215	OOALC Propulsion Unit Distribution Summary by Family Group (Part I)
DO24BFL1N	LOG-MMP(M)7215	OOALC Propulsion Unit Distribution Summary by Theater and Accounts (Part II)
DO24BGU1M	LOG-MMP(M)7224	Propulsion Unit Foreign Object Damage Report
DO24BHM1M	Exempt	Reimbursable Overhaul Transactions - Part I - Engines Removed This Month
DO24BHM1M	Exempt	Reimbursable Overhaul Transactions - Part II - Engines Removed in Previous Months
DO24BHM1M	Exempt	Reimbursable Overhaul Transactions - Part III - Diversions
DO24BHM1M	Exempt	Reimbursable Overhaul Transactions - Part IV - Applicable Aircraft
DO24BJG2M	Exempt	Propulsion Unit Reporting System Overhaul and Base Maintenance Completions
DO24BJH1M	LOG-MMP(M)7218	New Production Engines
DO24BLD1Q	LOG-MMP(Q)7232	Accumulative Engine Hours by TMS, Part I
DO24BLG1Q	LOG-MMP(Q)7232	Accumulative Engine Hours by Base, Part II
DO24BMNAM	Exempt	SAALC Engine Failures Under 100 Hour Warranty
DO24BMN9M	Exempt	OCALC Engine Failures Under 100 Hour Warranty

TABLE 4-5j. (Sheet 4 of 6)

Product Control Number	Report Control Symbol	Title
DO24CBI1D	LOG-MMP(D)7205	Propulsion Unit Automatic Resupply
DO24CDC3W	LOG-MMP(W)7204	Spare Engine Report
DO24CHS1M	LOG-MMP(M)7203	OCALC Propulsion Unit Resupply Time Report - Part I - ZI
DO24CHS1M	LOG-MMP(M)7203	OCALC Propulsion Unit Resupply Time Report - Part II - Overseas
DO24CHS1M	LOG-MMP(M)7203	SAALC Propulsion Unit Resupply Time Report - Part I - ZI
DO24CHS1M	LOG-MMP(M)7203	SAALC Propulsion Unit Resupply Time Report - Part II - Overseas
DO24DAE1Q	LOG-MMP(Q)7237	Propulsion Unit Pipeline Time Analysis, Part I - by Family, Command, Station
DO24DAE1Q	LOG-MMP(Q)7238	Propulsion Unit Pipeline Time Analysis, Part II - by Command, Station, Family
DO24DAM1Q	LOG-MMP(Q)7239	Propulsion Unit Pipeline Time Analysis, by Family, Command
DO24DAQ1Q	LOG-MMP(Q)7237	Propulsion Unit Pipeline Time Analysis, Part 1A - by ALC, Family
DO24FAON3	Exempt	Special Aircraft Fngine Actuarial Listing
DO24FAON4	LOG-MMX(Q)7203	Installed Active Zero Engines
DO24FBO91	Exempt	File Maintenance Change Errors
DO24FBO92	Exempt	Grouping File Maintenance Errors
DO24FBO93	Exempt	OFR (Official Failure Rate) Technical Data Change Errors
DO24FBO94	Exempt	Actuarial Errors
DO24FEO11	LOG-MMX(Q)7108	Master Grouping File
DO24FIO11	LOG-MMX(Q)7109	Aircraft Engine Actuarial Listing
DO24FIO21	LOG-MMX(Q)7110	Installed Aircraft Engine Report
DO24FIO22	Exempt	OFR Technical Data Record
DO24FIO23	LOG-MMX(Q)7115	Aircraft Engine Exposure Product
DO24FIO31	LOG-MMX(Q)7111	Aircraft Engine Removal and Loss Report
DO24FNO21	LOG-MMX(Q)7116	Aircraft Engine Exposure Product
DO24FNO22	LOG-MMX(Q)7120	Aircraft Engine Combined Failure Rate Product
DO24FNO23	LOG-MMX(Q)7112	Aircraft Engine Experience Analysis Product

TABLE 4-5j. (Sheet 5 of 6)

Product Control Number	Report Control Symbol	Title
DO24FRO11	LOG-MMX(Q)7121	Aircraft Engine Overhaul Failure Rate Product
DO24FRO12	LOG-MMX(Q)7113	Foreign Object Damage Summary Product
DO24FRO21	LOG-MMX(Q)7117	Aircraft Engine Field Maintenance Failure Rate Product
DO24FRO31	LOG-MMX(Q)7119	Aircraft Engine Combined Failure Rate Product
DO24FRO41	LOG-MMX(Q)7122	Aircraft Engine Overhaul Failure Rate Produce
DO24FRO51	LOG-MMX(Q)7118	Aircraft Engine Field Maintenance Failure Rate Product
DO24FSL11	Exempt	Contract Master Record
DO24FSL91	Exempt	Contract Number File Maintenance Errors
DO24FSL92	Fxempt	Actuarial Errors by Contract
DO24FSR11	Exempt	Aircraft Engine Actuarial Listing by Contract
DO24FSR12	Exempt	Aircraft Engine Exposure Product by Contract
DO24FYO11	LOG-MMX(Q)7114	Aircraft Engine Experience Analysis Product
DO24IAMFA	LOG-MMO(W)7130	ECMS T.O. Data Review Report
DO24IAMFB	LOG-MMO(W)7131	ECMS T.O. Data Error Report
DO24IAMFC	LOG-MMO(M)7132	ECMS Error Analysis and Age of Data Report, Parts I and II
DO24IAMFD	LOG-MMO(W)7133	ECMS T.O. Applicability Master Report
DO24IAMFE	LOG-MMO(W)7138	ECMS Overhaul Report
DO24ICI1F	N/A	ECMS Input Transaction Review Statistics, Parts I and II
DO24IMJ1A	LOG-MMO(M)71152	ECMS Active/Inactive Engine Classification Report
DO24IMJ3B	LOG-MMO(M)7134	ECMS Wing/Base T.O. Status Report
DO24IMJ1C	LOG-MMO(M)7135	ECMS Summary Wing Base T.O. Status Report
DO24IMJ1D	LOG-MMO(M)7136	ECMS T.O. Rescission Report, Part I
DO24IMJ1D	LOG-MMO(M)7136	ECMS Rescission Analysis Report, Part II
DO24IMJ1E	LOG-MMO(M)7137	ECMS T.O. Summary Report, Parts I-IV
DO24IMJ1F	LOG-MMO(M)7129	ECMS Command T.O. Summary, Parts I and II
DO24IMT1A	N/A	Class IV Engine Modification File Maintenance Exceptions List, Parts I - III
DO24IMU2A	LOG-MMO(M)71182	Class IV Engine Modification Summary
DO24ISL1A	LOG-MMO(AR)7139	ECMS Selected T.O. Status Report
DO24ISL1B	LOG-MMO(AR)7138	ECMS Overhaul Reports
DO24ISL1C	LOG-MMO(AR)7134	ECMS Wing Base T.O. Status Report

TABLE 4-5j. (Sheet 6 of 6)

Product Control Number	Report Control Symbol	Title
DO24JAN1T	N/A	Engine FIA Transaction History
DO24JBK4M	N/A	Engine FIA Code Correction Report
DO24JBK4P	LOG-MMP(M)7208	Monthly Transaction Listing
DO24JBY1Q	N/A	Depot Feeder Report
DO24JCE1Q	LOG-MMP(Q)7209	Uninstalled Propulsion Unit Dollar Data Report, Part I
DO24JCE2Q	LOG-MMP(Q)7210	Uninstalled Propulsion Unit Dollar Data Report, Part II
DO24JCE3Q	LOG-MMP(SA)7211	Installed Propulsion Unit Dollar Data Report
DO24KEO91	Exempt	Official Failure Rate (OFR) Factor Change Errors
DO24KEO92	Exempt	Forecast Official Failure Rate (OFR) Change Errors
DO24KEO93	Exempt	Factor File Maintenance Change Errors
DO24KCO11	Exempt	Official Failure Rate (OFR) Technical Data Record
DO24KLO11	Exempt	Aircraft Engine Forecasting Factors Master File
DO24KNO11	Exempt	Reasons for Actuarial Combination Rejections in Forecast Products
DO24KPO21	LOG-MMX(Q)7103	Projected Installed Aircraft Engine Inventory by Age Interval (W/W)
DO24KPO31	LOG-MMX(Q)7105	Forecasted Aircraft Engine Removals by Quarter, W/W
DO24KPO41	LOG-MMX(Q)7106	Forecasted Aircraft Engine Removals by Quarter, by Command
DO24KPO51	LOG-MMX(Q)7104	Projected Installed Aircraft Engine Inventory by Age Interval (By Command)
DO24KP061	LOG-MMX(Q)7107	Official USAF Acturial Removal Interval and Engine Life Expectancy Tables

Appendix 4-5F contains further amplification of the selected products and samples of the reports. A complete set of all products can be obtained from:

Propulsion System Section (ACDTP)
Technical Systems Branch
Data Automation Division
Comptroller
Oklahoma City Air Logistics Center
Tinker Air Force Base, Oklahoma

(e) Selected DO24 Output Product Descriptions.

1. DO24AEH1A, "Propulsion Unit Operating Time and Reconciliation Report", Part I and Part II, "Quarterly Operating Time Listing", is used for obtaining operating time reports for actuarial purposes and reconciliation of base engine assets.

2. DO24BBE1W, "ENORS Uninstalled Engine Status Report Summary by Command", provides data for surveillance and control of conditions where maintenance work stoppage resulted from nonavailability of parts.

3. DO24BBE2W, "ENORS Command History," is the same as DO24BBE1W above, except this product is summarized by command.

4. DO24BBJ1W, "ENORS Uninstalled Engine Status Report", provides data for surveillance and control of conditions where maintenance and work stoppage resulted from lack of engine spare parts. The report shows data for possessor and family group.

5. DO24BBN1W, "ENORS Uninstalled Engine Status Report, Type", is the same as DO24BBJ1W except summarized by engine type.

6. DO24BBR1W, "ENORS Uninstalled Engine Status Report Summary by Serial Number", is the same as DO24BBE1W except summarized by engine serial number.

7. DO24BCD1M, "Propulsion Unit Repairable Report", reflects the history of each engine from the time it is reported repairable until it is reported serviceable or installed.

8. DO24BGU1M, "Propulsion Unit Foreign Object Damage Report", provides data to evaluate the rate and extent of engine removals resulting from foreign object damage. It also lists major overhaul by type of aircraft.

9. DO24BJG2M, "Propulsion Unit Reporting System Overhaul and Base Maintenance Completions", provides data used by engine item managers to determine the number of engines that have completed an overhaul or a base maintenance cycle during the reporting period. The data are used to compute future workload factors.

10. DO24CDC3W, "Spare Engine Report", indicates the status of spare engine assets for each base. The report is a tool for command headquarters in monitoring the spare engine support position at each subordinate activity, and the effectiveness of resupply action.

11. DO24CHS1M, "OCALC Propulsion Unit Resupply Time Report", provides a method for measuring engine resupply time. Resupply time is the number of days between the date an engine is determined as requiring depot level (major) overhaul, and the date a serviceable replacement is received.

12. DO24DAE1Q, "Propulsion Unit Pipeline Time Analysis, Part I - By Family, Command, and Station", presents an analysis of desirable pipeline segment data for each family of engines, stations, and commands.

13. DO24DAE1Q, "Propulsion Unit Pipeline Time Analysis, Part II - By Command, Station, and Family", presents an analysis of undesirable pipeline segment data for each family of engines, stations, and commands.

14. DO24DAQ1Q, "Propulsion Unit Pipeline Time Analysis, Part IA - by ALC, Family", provides an analysis of desirable pipeline segment data for each family of engines at each command.

15. DO24FIO21, "Installed Aircraft Engine Report", contains data on installed aircraft engines, i.e., number, total, average operating hours, and average age. Data are summarized by command and engine-aircraft combinations. This report is the sole source of engine flying hours by reported engine-aircraft designation and command. Data are used by engine actuaries and for special studies.

16. DO24FIO22, "OFR Technical Data Record", shows data from the master files, including official failure rates and other data used to produce exposure and failure rate products.

17. DO24FIO23, "Aircraft Engine Exposure Product", tabulates exposures and removals, compares official failure rates of failures experienced during the quarter, and provides a summary of operating hours, removals, experience factors, and engine inventory distribution by age. These data serve as input to failure rate products, forecast products, quarterly engine status table, and special studies.

18. DO24FIO31, "Aircraft Engine Removal and Loss Report", shows data on all engines lost from the inventory or removed from an installed status during the quarter, and provides individually the reasons for failure,

removal or engine loss. The data are used in reliability analyses, quality control studies, and special studies concerning reasons for removal.

19. DO24FNO21, "Aircraft Engine Exposure Product", presents, by command, tabulations of exposures and removals; comparisons of official failure rates to rates of failures experienced during the quarter; a summary of operating hours, removals, and experience factors; and a listing of engine inventory distribution by age. The report provides inputs to command failure rate products, forecast products, and special studies.

20. DO24FNO22, "Aircraft Engine Combined Failure Rate Product", provides actuarial data by command for analyzing the effects of field maintenance on overhaul engine life, and to study actuarial engine life on total failures. This report is used to compute failure rates on total failures for maintenance; to calculate current dependability indices; to analyze, smooth, and project crude failure rates; and to test statistically both official and smooth failure rates; all by command.

21. DO24FNO23, "Aircraft Engine Experience Analysis Product", lists operating hours and failures by base, command, mission, overhaul agency, engine aircraft combination, and number of previous field repairs; and provides data for approximating engine life by subgroup and provides hours flown per failure. The report is used to analyze usage experience data according to engine source, command, model, and mission; and to determine which subgroups have abnormal experience.

22. DO24FRO11, "Aircraft Engine Overhaul Failure Rate Product", shows actuarial failure rates for major overhaul from exposure information grouped for several quarters, and is the source of new official overhaul failure rates. It is vital because it provides input to forecast products and special studies; statistically analyzes, smooths and projects the crude failure rates; computes actuarial engine life, actuarial life remaining figures, and actuarial removal intervals; and statistically tests both official and smooth failure rates on a world-wide basis.

23. DO24FRO21, "Aircraft Engine Field Maintenance Failure Rate Product", provides statistical analyses and projections of crude failure rates; field maintenance removal intervals and combined removal intervals; and both official and smooth failure rates.

24. DO24FRO31, "Aircraft Engine Combined Failure Rate Product", provides official combined failure rates and total failures for maintenance; current dependability indices; and statistical analyses and projections of crude and smooth failure rates. This product provides actuarial data for analyzing the effects of field maintenance on overhaul engine life, and inputs to experience analyses and forecast products.

25. DO24FRO41, "Aircraft Engine Overhaul Failure Rate Product", provides actuarial failure rates by command for major overhaul, from exposure information collected for several quarters; and is the source of official command overhaul failure rates. It provides inputs to command

forecast products, aircraft engine experience analysis products, and special studies. It is used for statistical analyses and projections of crude failure rates, computer actuarial engine life, actuarial life remaining, and actuarial removal intervals; and for statistically testing both official and smooth failure rates.

26. DO24FRO51, "Aircraft Engine Field Maintenance Failure Rate Product", provides inputs to forecast products, quarterly status table, and for special studies. It contains statistical analyses and projections of crude failure rates, field maintenance removal intervals and combined removal intervals, and both official and smooth failure rates by command.

27. DO24FYO11, "Aircraft Engine Experience Analysis Product", lists engine operating hours and hours flown per failure by base, and presents data for computation of actuarial failure rates and approximate engine life by subgroup. The report is used for statistical analysis of usage experience data according to base of operations and to determine which subgroups have abnormal experience.

28. DO24KPO31, "Forecasted Aircraft Engine Removals by Quarter, Worldwide", presents forecasts of engine removals for major overhaul and field maintenance and both combined, including forecasts of maximum time removals with peacetime programs. The report is used to:

a. Determine overhaul schedule requirements

b. Schedule deliveries of new engines

c. Determine spare parts and workload

d. Determine field maintenance requirements

e. Assist in planning for facilities, equipment, and personnel

f. Compute spare engine requirements.

29. DO24KPO41, "Forecasted Aircraft Engine Removals by Quarter, by Command", is the same as DO24KPO31 (item 28 above), except that it is limited to commands.

30. DO24KPO61, "Official USAF Actuarial Removal Interval and Engine Life Expectancy Tables", provides a three-part listing: W/W actuarial removal inverval tables (Part I), engine life expectancy tables (Part II), and percentages and ratios of auxiliary power units and ground gas turbine engine applicable to appropriate aircraft (Part III).

(7) Standard Base Supply System (SBSS) U1050-II.

(a) Objectives.

1. The objectives of the Standard Base Supply System with respect to the logistics support of Air Force weapon systems is to provide methods for timely response to user needs for materiel, and for firm central management of base-level inventory control. The SBSS is designed to enhance the supplier/user relationship through the organizational interface between maintenance control and supply. The organizational component of maintenance control that directly interfaces with Supply is material control, which may consist of four functions: maintenance supply liaison, reparable processing, mobility support, and organizational supply support.*

2. The SBSS utilizes the Univac 1050-II computer, which is programmed to generate output reports necessary for effective maintenance management. Several of these reports are of value during operational test and evaluation to assist in the assessment of maintenance repair capability and supply issue effectiveness.

(b) Policy and Procedural Documentation.

Policy and procedural documents applicable to the SBBS are listed below.

1. AFM 67-1, USAF Supply Manual; Volume 1, Part 2, USAF Standard Base Supply System.

2. AFM 66-1, Maintenance Management; Volumes I through XII, Materiel Control sections.

3. TO 00-20-3, Maintenance Processing of Reparable Property and the Repair Cycle Asset Control System.

(c) Data Forms and Inputs.

1. AFTO form 350, Reparable Item Processing Tag.

The data interface between maintenance and supply is via AFTO form 350, "Reparable Item Processing Tag." When a demand is made from supply for a replacement item, a supply document number is obtained from supply and recorded on AFTO form 350. Supply personnel record pertinent information on AF form 2005, "Issue/Turn-in Request", bearing the supply document number. This form correlates supply transactions with maintenance actions.

*For complete descriptions of the responsibilities of Materiel Control, refer to the applicable sections of AFM 66-1, Volumes II through XII.

2. AF Form 1998, 1050-II Base Supply System Card.

The SBSS Univac 1050-II computer is programmed to update current repair cycle item location and status on an individual item basis. Each time a reparable changes location or status, an AF form 1998 is filled out and this information is input to the 1050-II computer.

(d) Output Products of the SBSS Univac 1050-II.

AFM 67-1, Volume 2, Part 2, lists base-level output reports available from the SBSS U1050-II computer. The following paragraphs describe the products of interest during test and evaluation. Appendix 4-5G contains samples of selected SBSS output reports.

1. DIFM Listing (R26).

The Due-in-From-Maintenance (DIFM) Listing is produced by the 1050-II computer from internally stored supply records to aid maintenance activities in controlling reparable processing and DIFM assets. The DIFM Listing is available in three format options: DIFM Listing, DIFM Exception Listing, and DIFM Stock Number Listing. These management products provide a current inventory of DIFM items, including location and status.

2. Repair Cycle Data Listing (M024).

The Repair Cycle Data Listing complements the DIFM Listing (R26) for scheduling of repair cycle assets, determining base repair capability and DIFM control. It is also used to determine the number of units repaired, categorized as NRTS (not repairable this station), and condemned for the past year, and identifies current quarter turn-ins by action taken code. Potential problem areas may be indicated by identifiable trends.

3. Organizational Effectiveness Report (M24) reflects the supply issue effectiveness for the month as a percentage of fill rate. It includes the effectiveness of supply points, bench stocks, and other issues and due-outs. Support problems may be indicated by the percentage of support provided in each area.

4. NORS Start/Stop Report, HAF-LGS(AR) 7113 (D23/854). This report provides an NORS summary within system designator of total cause code and delete code.

(8) Base Level Inquiry System (BLIS), P107A/R1.

(a) Objective: The objective of the Base Level Inquiry System (P107A/R1) is to provide users of B3500 Automated Management Supporting Data Systems with an effective, simple-to-use system for extracting management information from data base files.

(b) Output Product: The output products available are limited only by the data in the files, the imagination of the analyst, and machine time available. Data and expressions available are the same as those listed in the discussion of the Maintenance Data Collection System, subsection 4-5b(1). Most maintenance analysis technicians (AFSC 390X0) have the training to retrieve data.

(c) Documentation: AFM 171-114, Base Level Inquiry System (BLIS), P107A/R1, provides the general system information, specification, and resource requirements. AFM 171-114 is contained in three volumes, with Volume III providing system user restrictions.

(9) Machine Independent System Effectiveness Data System (MISEDS).

(a) Objectives – The Machine Independent System Effectiveness Data System (MISEDS) provides a set of computer programs to reduce and analyze a comprehensive set of reliability and maintainability input data products. Four processing programs perform the function of creating historical files of reliability and maintainability data products to be input into other programs for analysis. Quantitative reliability programs provide nonparametric statistics as a measure of subsystem reliability. These programs provide man-hours per maintenance task, maintenance man-hours per flying hour, AGE utilization, and man-hour data to verify maintenance personnel requirements.

(b) Policy and Procedural Documentation for MISEDS.

1. Maintenance Technical Directive 69-1, Air Force System Command, Systems Effectiveness Data System, AFSC Form 258/258-4, Maintenance Data Recording Procedures.

2. Machine Independent System Effectiveness Data System (MISEDS) Documentation, Air Force Flight Test Center, Edwards AFB.

(c) Data Collection Forms/Data Sources for MISEDS – All reliability and maintainability data products from MISEDS are obtained from the data recorded on the AFFTC form 300, AFSC form 258/258-4, and AFTO form 4. Computer programs within MISEDS perform basic calculations, combine and reformat the data items, and structure logical records into reliability and maintainability history files.

1. AFFTC Form 300, "Aircraft Debriefing Record", is used for recording reliability data for all aircraft subsystems having mission debriefing periods. This information includes:

a. Mission identification data

b. Subsystem reliability data

c. Subsystem discrepancy write-ups.

2. AFSC Form 258, "Maintenance Discrepancy", and AFSC Form 258-4, "Production Credit Record", are used to record:

a. Job identification data

b. Failed item data

c. Installed item data

d. Data describing discrepancy, maintenance required, and corrective actions.

e. Elements of the maintenance action

f. Piece parts replaced during repair.

3. AFTO Form 4, "Operating Time Report for Selected Items", provides for periodic elapsed time indicator (ETI) data that can be merged with the AFSC form 258 data file. The merged data file provides a listing by part number and serial number of component ETIs, removal, and replacement. This is a basic tool from which component MTBFs may be computed from operating time, events, cycles, etc. The following information is recorded on AFTO form 4:

a. Aircraft-type serial number

b. Report date

c. Flying hours

d. Work unit code

e. Component noun

f. Component part number and serial number.

(d) Output Products of MISEDS.

Thirteen output products are produced by the MISEDS programs, as follows:

1. Personnel Subsystem Test and Evaluation

2. Flight Crew Discovered Discrepancy

3. 258 Edit

4. Active Man-Hours Task Summary

5. Maintenance Man-Hours per Flying Hour

6. Aircrew Evaluation

7. Safety Code

8. Maintenance Event

9. AGE Utilization

10. Action Taken

11. Component Discrepancy

12. Subsystem Inflight Discrepancy

13. Flying Hours per Subsystem

(e) The following paragraphs, 1 through 13, briefly describe each of the output products. Appendix 4-5I contains detailed descriptions of selected products and discusses the theory, equations, and algorithms of the displayed parameters.

1. Personnel Subsystems Test and Evaluation (PSTE) Report.

The PSTE output report includes both 1- and 6-month manpower predictions. In addition, total number of tasks, total man-hours, mean man-hours per task, and man-hours per flying hour are presented for all Air Force specialty codes (AFSCs) and work unit codes as described in table I-1 of appendix 4-5I. WUCs are to the fifth indenture level.

2. Flight Crew Discovered Discrepancy Report.

The Flight Crew Discovered Discrepancy Report contains a convenient chronological log of mission debriefing data. This log can be used to isolate those subsystems for which numerous discrepancy indications have been recorded. Included in the report are, for given WUCs, the total number of discrepancy indications for all missions, the number of discrepancies per flight hour and per mission, the percentage of total discrepancies, and a summary of these data.

3. AFSC Form 258 Edit Report.

This report provides a convenient listing for maintenance data error checking and verification of maintenance actions. The data are arranged onto an output page according to the logical sections found on the AFSC form 258.

4. Active Man-Hours Task Summary (AMTS) Report.

The AMTS report provides a valuable tool for aircraft maintainability assessment by identifying those areas in which large numbers of

hours, man-hours, and maintenance tasks were generated. The report presents active hours per task (elapsed time from start to completion of maintenance task, minus delay time) man-hours per task (active time multiplied by number of men working on the task), active hours per flying hour, and man-hours per flying hour.

5. Maintenance Man-Hours per Flying Hour (MH/FH) Report.

The MH/FH report presents line and shop man-hour totals and percentages for all two-digit work unit codes.

6. Aircrew Evaluation Reports.

The Aircrew Evaluation Report summarizes the reliability performance of a number of flights, and is used to isolate subsystems with reliability problems, to measure reliability performance, and to provide input information to reliability models. The report presents total flying hours on each subsystem and a breakdown of the subsystem malfunction by reliability code (see table I-6, appendix 4-5I).

7. Safety Code Report.

The Safety Code Report provides a periodic summary of malfunctions that adversely affect flight safety, and includes two output tables. One table lists subsystem names, reliability codes, safety codes, and narratives of all malfunctions. The second table presents a summary of safety code entries for each subsystem and the total number of each safety code recorded against the aircraft.

8. Maintenance Event Report.

The Maintenance Event Report is a listing of reconstructed maintenance tasks. All actions within the maintenance task are grouped and the set printed. Sufficient information is provided for each maintenance action and the complete task to indicate the quantitative and qualitative nature of the task. Information listed for each task includes the bridged data fields; the noted discrepancy and corrective action taken for each maintenance action; report/copy number and date; and active hours, man-hours, and elapsed hours, work unit code, how malfunctioned code, and when discovered code for each action.

9. AGE Utilization Report.

The AGE Utilization Report provides a quantitative report on AGE utilization during DT&E. The report displays AGE operating time, total number of uses, average operating time, and operating time per 100 flying hours.

10. Action Taken Report.

The Action Taken Reports are utilized to determine those subsystems that require the greatest expenditure of maintenance actions. Two reports can be selected: the Units Summary Report, which prints the total units of work completed for each action taken code and work unit code combination; and the Action Summary Report, which totals the number of occurrences of each action taken code by work unit code.

11. Component Discrepancy Report.

This report provides a listing of the subsystem/component discrepancy writeups and their subsequent corrective actions. Also presented are total man-hours, units of work, how malfunctioned code, and when discovered codes.

12. Subsystem Inflights Discrepancy Report.

The Subsystem Inflight Discrepancy Report provides a chronological listing of discrepancy writeups recorded against specific aircraft subsystems.

13. Flying Hours per Subsystem Report.

This report provides tables of subsystem utilization rates. The output includes monthly and yearly flying hour totals, and grand totals.

(f) From the above discussion, it may seem that the usefulness of MISEDS is limited to the information contained in the 13 products mentioned. Such is not the case. Arrangements can be made (usually at some cost) to have programs written that will sort, select, compile, and compute the data elements contained in the MISEDS history tapes, in almost any desired manner. Programs can be written to introduce new types of information into the computer. Storage and handling of this new data in any desired manner can also be implemented. Utilizing the above capabilities, logistics parameters can be computed that will meet nearly any desired definition, criteria, and computational procedure.

(10) Maintenance Management Information and Control System (MMICS).

(a) Objectives and Scope of MMICS.

1. Objectives.

MMICS was designed to update existing maintenance management and data collection systems of the Air Force. The new system enables base-level maintenance managers to utilize their assets (personnel, equipment, facilities, and materiel) more effectively by providing the data required for off-base reports as a byproduct of data collected during maintenance. MMICS reports will be, for the most part, in plain language rather than

coded to look-up tables. Reports will be generated on request, rather than "forced" periodically. Further, all data provided to off-base activities by maintenance will continue to be provided in its current format. This includes maintenance data (RCS:LOG-MMO(AR)7142), manpower data (RCS:HAF-PRM(a) 7101), and status data (RCS:HAF-LGY(D)7140).

2. Scope.

MMICS is being implemented on an incremental basis. Three increments encompassing the following functional areas have been defined.

a. Increment 1.

Increment 1 consists of four elements: training, administration, time compliance technical orders (TCTOs), and status. Incorporated into the status element is the estimated time in commission (ETIC) monitor. Increment 1 provides the capabilities for data collection and report generation, and is also a segment of the final integral part of the control process. Increment 1 does not provide the capability for extraction of base-level data for command use.

1) The status segment is a data collector and report generator. Changes to aircraft status, or inventory gains and losses, are input to the computer as they occur. Reports are generated when status limits established by the unit are exceeded, or upon demand.

2) The ETIC/event monitor is the control segment. The event monitor is an internal alarm system that notifies job control of impending and overdue situations.

3) The administrative portion of Increment 1 gives maintenance a completely new capability for controlling manpower resources. Organizational tables, work center records, and maintenance personnel records for each assigned individual are loaded into the computer. This provides the capability to generate a variety of reports to assist in the management of maintenance personnel.

4) The training management portion of Increment 1 provides management with readily accessible report pertaining to training status of individuals, training courses, schedules, etc.

b. Increment 2.

The delayed discrepancy file and operational events package is the second increment of the MMICS incremental implementation plan.

1) The delayed discrepancy files portion of Increment 2 encompasses the delayed/deferred discrepancy files designated by the local maintenance activity.

2) Discrepancy recording is accomplished on the computer on-line using "event" and "create work center event" routines. These on-line routines record the discrepancy data in the prescribed format in a computerized record.

3) Supply data recording for delayed/deferred discrepancies is accomplished using the "job-supply data" routines. This on-line routine source supply data, i.e., document number, estimated delivery date, etc., is a maintenance event record previously established by the event routine.

4) Several options are available for the retrieval of event data. An "event state inquiry" routine provides the current status, excluding supply status, of a basic event and each designated work center event.

5) Supply requisition inquiries provide status of an item on requisitions for each equipment ID number. Status includes the document number, status date, urgency code, and estimated delivery dates.

6) A delayed/deferred discrepancy list can be produced for each equipment ID number on a demand basis. This routine prints all discrepancies on file for the designated equipment ID, and includes supply document numbers for each discrepancy in an awaiting parts (AWP) status.

7) An event list option is provided that must be processed through a TC-521 remote terminal or card reader, with the output at the line printer to produce a listing of the complete discrepancy file for all equipment ID numbers. Options within this program provide a list of discrepancies for a specific work center, or a single equipment ID number; or for all discrepancies for an MDS or end item work unit code.

8) The operational events portion of Increment 2 accommodates the operational commitments in the maintenance schedule. The operational events portion is described in two states: mission accomplishment and analysis.

a) The mission recording, also considered to be the scheduling stage, records each mission (event) in the computer with the scheduled start and stop date/time. All data relating to fuel load, type missions, estimated flying time, and a scheduled/unscheduled indicator are recorded.

b) Mission accomplishment is the period of time from start to stop of an operational event. Start and stop times are determined by the operations/maintenance control, and are entered in the machine during mission recording as described above. Prior to and during the accomplishment, event status, operations event lists, proposed schedules, and daily mission schedules are available to maintenance management. Cancellations and delayed events are recorded using abort, cancellations, and delay codes to provide for subsequent analysis of the accomplishment report.

c) The analysis stage provides the capability for periodic reports of mission accomplishment, summary of flying hours, missions flown versus missions scheduled, and data related to aborts, cancellations, additions, late takeoffs, substitutions, and delays.

c. Increment 3.

Increment 3 of MMICS is the documentation of work unit codes, job standards, and mechanized equipment records.

1) Individual WUCs, or a complete listing of all codes, may be retrieved for a specific type of equipment. Data relevant to a specific standard job, i.e., repetitive maintenance tasks, inspection, and time changes required on assigned equipment, may be retrieved. Several methods of retrieval are available for the mechanized equipment records of controlled items. Controlled items are those managed under the Advanced Configuration Management System (ACMS), or items having an established inspection or time change interval and are installable on other items of equipment. Records are retrievable for each controlled installable engine or part/serial numbered item. The options available for retrieving controlled item records are:

a) Selected end items. This option produces a listing identifying the requested end items and all installed components.

b) Engines or part-serial-numbered items. This option may be used to obtain the installed location of all engines of the same type, or all serial numbers having the same part number.

2) The retrieval of due-date or due-time data for recorded inspections or time changes is available for a selected item of equipment or for all items within the same equipment designation. A limited forecast of upcoming inspections and time changes is made available through the use of the operating time update routine. The current equipment operating time for a selected end item may be obtained by one of the following:

a) Using the point option of the operating time update routine. This provides the current equipment operating hours.

b) Using the current operating time program. This provides the current operating hours recorded for the requested end items and for each installed component.

In addition, a graphic display of time remaining to a specific inspection or time change requirement is available by using the time distribution inquiry program.

(b) Policy and Procedural Documentation for MMICS.

As previously stated, MMICS is still in the implementation phase. The document that most completely describes MMICS is AFM 66-278, Volumes I through V.

(c) Data Collection Forms/Data Sources.

The source data for MMICS is provided by the G033 ADS of the 65-110 system. MMICS is unique, however, in employing remote terminals for the input of data in lieu of the manually recorded and subsequently keypunched data that normally provides the input to the computer. The remote TD806CRT or TC521 keyboards are used with MMICS. This system will eventually eliminate the need of the AF form 359, and will convert the AFR 65-110 system to on-line operation.

(d) Manual Backup System for MMICS.

1. During the operation of MMICS, there will be periods of time when the B-3500 will not be available for use by maintenance organizations. These periods of nonavailability may be caused by the necessity of performing preventive maintenance on the B-3500; hardware or software malfunctions; or the necessity of performing computer housekeeping requirements, e.g., file dumps, MMICS history dump, etc. During these periods of nonavailability, maintenance will continue to operate using the manual backup procedures described below. Essentially, for Increment 1, each function, e.g., job control, training, administration, etc., assumes the communication and maintenance functions of the computer. The information normally entered into the computer via the remotes will be formatted by each functional area on AF form 1530. After the computer returns to an on-line status, it will be necessary to quickly update the MMICS files to the current status. Each MMICS program description (see AFM 66-278, Volume II) has instructions for file update processing. Since the data files will not be accurate until they are updated, inquiry inputs should not be formatted on AF form 1530 during the time the unit is operating in manual backup.

2. There are basically three modes of updating the files once the computer comes back on line: the file update (FUD) routine, updating through the unit's card reader, and updating by individually inputting the transactions through the TC-521. While all three methods require the use of AF form 1530, the recording procedures are slightly different for each. What determines the update method to be used is the number of transactions that each functional area would generate during the time the computer is down. Thus, when the computer goes down, a determination should be made as to the expected length of time it will be down. Once the down-time is known, the host unit, in coordination with tenant MMICS users, will determine the method for updating the data files when the computer is once again operational. If there are more than 50 to 60 inputs to be made per unit by the time the system comes up, the FUD method should be used. For quantities less than 50 to 60 inputs, the card reader or the TC-521 can be used. Regardless of the method to be used, no inquiry inputs should be formatted for processing during the time the files are being updated. Recording procedures for each of the three methods of file updating are described in AFM 66-278, Volume I, Section F.

(e) Output Products of MMICS.

The output products of MMICS are identified by the program routines that generate the output reports. A single routine is capable of generation reports in one of several formats. The following paragraphs contain descriptions of selected output products available with MMICS. Complete descriptions of all MMICS output products can be found in AFM 66-278, Volume II.

1. Equipment Status Inquiry.

The reports generated by this routine are designated to provide as much data as possible relevant to current status of assigned equipment. The reports are used primarily to determine equipment status of an equipment designator, a single equipment ID, or a listing of all equipment IDs with a given status condition. There are three formats to this report, as follows:

a. Equipment Designator Status Report.

This report provides status, status reason code, WUC, and the ETIC (if one exists). Location and configuration code will be available with the implementation of MMICS Increments 4 and 5, respectively. These data are provided relevant to all assigned equipment IDs of the input equipment designator. The report has two formats, one providing status and ETIC data plus the start time of the next scheduled sortie or sorties for the day which the report covers, and the other providing status and ETIC data only. (The next scheduled sortie format will be available with the implementation of Increment 2 of MMICS.)

b. Single Equipment - ID Status Report.

This report portrays status and ETIC data relevant to a single equipment ID. The next scheduled sortie option is not available with this report.

c. Specific Status Report.

This report portrays status and ETIC data for all assigned equipment IDs of the input equipment designator.

2. Equipment Status Routine.

a. The reports generated by this routine provide information relevant to the status of assigned equipment. In conjunction with the Aerospace Vehicle Status Report, the routine that generates these reports serves to eliminate the need to maintain a file of reports relevant to status data, and to enhance the manager's ability to rapidly acquire summarized or detailed reports displaying status and inventory data on the units assigned equipment.

b. The equipment status information requested may be specified as to time period, type of equipment, and type of report (summarized or detail). Data are portrayed in three different formats:

1) Format 1 represents a summarized equipment status report for whatever equipment designator and time period is input.

2) Format 2 provides a summarized equipment status report for whatever equipment ID and time period is input.

3) Format 3 provides a detailed status report for whatever equipment ID and time period (restricted to 31 days) is input.

3. ETIC Inquiry.

This routine generates reports that portray an ETIC, if it exists, for a single equipment ID of all ETICs loaded for a given equipment designator. This report will also show, for each equipment ID listed, all operational events scheduled up to and including the day and time of the ETIC.

4. Individual TCTO Inquiry.

The reports generated by this routine are designated to provide the TCTO status for one TCTO on one item of equipment. The output includes all supplements that apply to the TCTO.

5. Maintenance Personnel Inquiry.

This program provides the capability to extract selected data from an individual personnel record. The user has the option of selecting any of the following:

a. Training Status/AFSC Inquiry

b. Duty Status Inquiry

c. Accounting Data Inquiry

6. Skill Level Inquiry.

This program provides management with a skill level summary for a work center. The output gives the number of personnel authorized and assigned, and the percent manned, in each skill level.

7. Status Update.

This routine, in conjunction with the operating time update (OTU) routine, totally automates for aircraft the AFR 65-110 reporting system in MMICS units. The routine is used to maintain current status and status history, and to report inventory gains and losses for unit assigned equipment. The routine has essentially two parts; current status reporting and inventory reporting.

8. TCTO Data Code Inquiry.

This routine provides maintenance managers with information concerning a specific TCTO. This is an in-line routine giving the user the option of two output products, as follows:

a. Open TCTOs.

This output provides information on each item of equipment on which the TCTO is applicable but has not been compiled with.

b. Completed TCTOs.

This output will list all items of equipment upon which the TCTO has been accomplished.

9. Work Center Roster.

This program provides the capability to provide a listing of all personnel assigned to a work center, or a listing of all personnel within a work center authorized to sign off a "red X".

10. Equipment List.

This program enables the maintenance manager to obtain a current listing of assigned equipment. The outputs produced by this program will contain all the equipment in the unit or work center that is loaded for a given equipment designator, specific part number, or all part numbers, dependent upon the input format used. The following is a summary of the options available.

Format	Type Equipment
a	Equipment designator by mission and design (MD)
b	Equipment designator by mission, design, and series (MDS)
c	Engines by type and model (TM)
d	Engines by type, model, series, and modification (TMSM)
e	End item WUC item
f	All MDS, engines, or WUC items for a unit or work center
g	Specific part number items for a unit
h	All parts for a work center

11. Aerospace Vehicle Status Report.

a. This program provides an output to assist in monitoring the operational and maintenance status of a particular type of aerospace vehicle, or one item of equipment, identified by an equipment ID. This report will be produced for aerospace vehicles possessed by a single unit and identified by MD, MDS, or equipment ID.

b. Depending on the format option input, this program will provide a status summary report by reason and cause for a period of 99 days; status distribution by day and average distribution by time, for 31 days; or a combination of status summary and distribution for 31 days. The program reviews the AFR 65-110 status data to produce the report. The status is subdivided into the following categories:

1) Operationally ready (OR).

2) Not operationally ready maintenance-grounded-unscheduled (NORM/G-UNSCH)

3) Not operationally ready maintenance-grounded scheduled (NORM/G-SCHED)

4) Not operationally ready maintenance-flyable (NORM/F)

5) Not operationally ready supply-grounded (NORS/G)

6) Not operationally ready supply-flyable (NORS/F)

c. The reports are used to show the maintenance status of aerospace vehicles, to monitor the NORM and NORS status, to determine causes of down time, and to help identify possible changes in the schedules that will provide a smoother flow of maintenance.

12. Maintenance Personnel List.

This program provides listings of personnel in alphabetical sequency by last name, or numerical sequence by primary AFSC or man number. The output can be used as a reference for information concerning assigned personnel.

13. Skill Level Report.

This program provides management with a skill level report for an organization, sequenced by individual work center and summarized by organization. The program extracts the authorized and assigned totals from the manpower resources data in the work center record. This information is computed as percentage of authorized versus assigned, and displayed by officers, airman levels 9,7,5, and 3, and civilians.

14. Serial Number Detail Listing.

This program is designated to provide the status of all TCTOs applicable to a specific item of equipment. The output report shows summarized TCTO data for the period of time indicated in the input. The report is provided by equipment ID or part and serial number.

4-6. QUALITATIVE EVALUATIONS.

This section presents a structured approach for qualitative evaluation of tests applicable to logistics assessment. The approach is applicable to the majority of test situations, although the parameters of interest may vary. This section addresses the general subject of qualitative evaluations and their utility in logistics assessment, and identifies those situations requiring qualitative evaluations and processes. These evaluations should be considered as sub-objectives of the major areas of assessment: reliability, maintainability, availability, and logistics supportability. They must be tailored to both expand on quantitative assessments accomplished and provide other separate and distinct evaluations that cannot be quantified.

a. Utility of Qualitative Evaluations.

(1) Each test project will have unique characteristics, dependent upon the type of equipment to be tested; constraints in terms of money, manpower, and time; operational requirements; military need for the end item; and factors associated with design, development, and deployment of the end item. In some instances it may be impractical to run sufficient tests to obtain statistical significance for evaluating selected parameters. In other instances, statistical data are not required to evaluate certain conditions. When these circumstances exist a qualitative approach must be utilized in performing the evaluation.

(2) For those parameters stated in qualitative terms, care must be taken in identifying the qualitative measures of merit. Clear definitions must be developed to ensure universal understanding of their meaning. Once the selected qualitative measures of merit have been defined, relative measures of effectiveness can be established to determine the degree of attainment for each measure of merit. This could be accomplished as follows, taking as an example the parameter, "susceptibility to incorrect maintenance actions".

(a) A comprehensive definition of the specific elements of this parameter is developed.

(b) A series of questions associated with a variety of maintenance actions is identified.

(c) A checklist type of questionnaire is developed and copies made available for test team usage.

(d) Questionnaires are completed for the variety of maintenance actions that are performed on the end item.

(e) All questionnaires are evaluated and a qualitative assessment of the parameter is derived.

The number and type of questions to be developed will depend on the parameter to be evaluated. The evaluation of some parameters can be accomplished using

only a few questions. Others may require several pages of questions to obtain the necessary information for a qualitative judgment.

(3) The first eight qualitative parameters listed in table 4-2g are basic elements of an Integrated Logistics Support (ILS) program for systems and equipment. ILS requirements were established by DoD Directive 4100.35, and were implemented for the Air Force by AFR 800-8. The ninth parameter is associated with configuration management. These parameters represent additional areas that must be addressed during OT&E. Every effort should be made to perform some type of qualitative evaluation of these parameters.

(a) Each OT&E program will be different with respect ot the number of qualitative parameters that can be evaluated. Usually there can be an evaluation of the maintenance plan and support concept, and configuration management. Evaluation of the remaining parameters may not be possible, some limitations and reasons being:

1. Technical data development usually lags hardware availability by 6 to 18 months.

2. Test and support equipment for an end item are not usually developed until after the hardware has gone into production. Equipment utilized for test and support of prototype end items usually reflect factory-type hardware that may not be representative of the final design.

3. The quantities of initial and replacement spares provided for prototype hardware can be significantly different from the quantities established for the production hardware.

4. Supply support may be provided by the contractor for prototype end items.

5. Existing support facilities may be utilized for prototype hardware. New or modified facilities may be required for the production end items.

6. Training in the use and maintenance of prototype end items usually involves instruction by contractor personnel. Formal training by the Air Training Command (ATC) often starts after production end items are available in the inventory.

(b) Although these qualitative parameters have been listed as separate items, there is considerable dependency among them. For example, the quantities of initial and replacement spares are based on the support concept adopted; and training is based on the various levels of maintenance to be performed, which in turn are based on the maintenance plan. In evaluating qualitative parameters these dependencies must be considered. Each test and evaluation program will have different logistics elements and therefore different criteria applicable to these parameters. Test plans must specify the unique characteristics of each program and identify the appropriate qualitative parameters to be evaluated.

(c) An Integrated Logistics Support Plan (ILSP) is required for new Air Force systems and equipment. This document delineates an overall plan for implementing the concepts, techniques, and policies required to achieve the objective of effective and economical support of a system or equipment for its life cycle. The ILSP, along with implementation reports pertaining to the status of the various logistics elements in the plan, will provide a baseline for the evaluation of most qualitative supportability parameters. However, all qualitative supportability parameters may not be applicable to all OT&E programs; parameters of interest will have to be selected for each end item under test. The following paragraphs discuss these parameters, suggest elements to be considered in their evaluation, and reference documents where additional information is available.

1. Maintenance Plan and Support Concept.

a. New Air Force programs for systems and equipment are required to have a maintenance plan as part of the ILS effort. This plan is prepared to delineate concepts and requirements for each level of maintenance to be performed during the life of the system or equipment. The using command maintenance concept or plan must be compared with the ILSP, and differences identified and resolved. After resolution, the plan should:

1) Define the actions and support necessary to ensure that the system or equipment will attain a specified operational capability.

2) Establish specific criteria for time to repair end-item equipment, AGE, maintenance skills, and facility requirements.

3) Determine specific maintenance tasks to be performed at each maintenance level (organizational, intermediate, depot, or contractor).

4) Identify the workloads and time phasing for accomplishing maintenance activities.

b. The Air Force also requires that contractors submit plans for and perform repair-level analyses on all contractor-furnished end items. This plan and the subsequent analyses will provide valuable information concerning the assignment of maintenance tasks to the various maintenance levels. These task assignments are based on a number of operational and economic constraints. The Optimum Repair Level Analysis (ORLA) takes into account these constraints in developing the support concept for the end item. AFSC/AFLC Manual 800-4, Optimum Repair Level Analysis, provides guidance and direction that may be used by the test team in establishing qualitative evaluation criteria.

2. Supply Support.

a. Supply support encompasses all actions and functions associated with acquisition, cataloging, packaging, preservation, receipt, storage, transfer, issue and disposal of spares, repair parts, bulk materials,

consumables, and fuel. These actions and functions are associated with maintaining a system or equipment in an operationally ready state under the diverse conditions of military use. The primary objective of supply support is to provide the correct spares, repair parts, and supplies at the time and place they are needed. Functional categories include procurement, distribution, and inventory replenishment.

b. In the OT&E environment, only a portion of the above supply support actions and functions may have been implemented for an end item. Some reasons include:

1) The contractor may provide maintenance efforts, spares, repair parts, etc., as part of his contract activities.

2) The test program may rely only on the initial spares and repair parts supplied with the end item.

3) The program may have an Air Force/ contractor implemented maintenance effort.

4) Some hardware may be GFE, and rely on existing supply support activities for those end items.

c. Air Force Manual 67-1, USAF Supply Manual, provides considerable information concerning all supply functions and should be used as a reference for developing and evaluating qualitative supply support criteria.

d. In addition, the following techniques may be used to evaluate supply support. Consumption data can be compared with projected support requirements. Data should be collected, compiled, and evaluated to predict requirements at the main operating bases, forward operating locations (FOLS), and in the deployed status. Actual usage data can be compared with the contents of provisioning documents, Initial Spares Support List (ISSL), War Readiness Spares Kit (WRSK), proposed bench stock listings, etc. Delayed discrepancies can be reviewed to determine supply impact. In making these assessments, the following areas should be measured and analyzed:

1) Not repairable this station (NRTS) rates

2) Condemnation rates

3) Mean time between demands (MTBD)

4) Not operationally ready supply rates, by equipment and component causing NORS condition

5) Cannibalization rates, by equipment and component being cannibalized

6) Comparison of consumption rates with provisioning documents, ISSL, WRSK, bench stock listings, etc.

7) Comparison of items having high MTBD with the source maintenance recoverability (SMR) coding and causes of NORS cannibalizations, to evaluate potential changes in local repair authorizations.

8) Comparison of projected consumption and stockage values with test experience. Analysis of data for supply support suitability compared with projected equipment utilization rates.

3. Transportation and Handling.

a. Transportation and handling comprise the actions, procedures, and constraints that ensure a capability to preserve, package, handle, and transport all systems, equipment, and support items. These actions, procedures, and constraints are based on considerations such as design, specifications, configuration, geographic and environmental restrictions, operational analyses, transportability criteria, handling equipment and procedures, and packaging and preservation concepts and criteria. Air Force Manual 75-1, Transportation of Materiel; Air Force Regulation 71-1, Packaging Management Objectives; and Air Force Regulation 80-18, Department of Defense Engineering for Transportability, provide guidance and information concerning transportation and handling. These documents should also be used as references for developing and evaluating qualitative criteria for this parameter.

b. A transportation and handling discrepancy form, or qualitative Parameter Evaluation Sheet (figure 4-6a), to record and document problems may be developed by test teams. These data can be collected by test team personnel, compiled, and filed as reference/supportive material. Data products can be obtained from the MDC system showing actions with when discovered code Y and/or how malfunctioned code 086. These occurrences can then be investigated as to the cause. The following factors should be considered:

1) Conditions will be observed and deficiencies reported on outsize components to identify peculiar requirements, needed improvements, and special precautions.

2) Adequacy of provisions for timely deployment of support equipment to forward bases will be evaluated.

3) Provisions for transportation and handling after delivery from supply, and the ease or difficulty of handling during installation and removal actions, will be evaluated. Suitability of handles, carrying devices, and protective devices (dust, shock, impact, moisture) will be reported.

4) Applicable tables of allowance (TA) will be used to evaluate programmed quantities of special handling devices, etc., versus requirements at main operating base locations and at forward locations.

5) Condition of items with shelf life/cure dates when withdrawn from stock will be checked.

6) FOL and deployment dictated requirements will be evaluated.

4. Technical Data.

a. Technical data provide the information necessary to translate system and equipment requirements into discrete operational end items; and subsequently, to develop, produce, deliver, operate, and maintain the end items in a prescribed state of operational readiness. The timely development and distribution of technical data is essential to any OT&E program. Of primary importance are the adequacy and accuracy of the data. Elements applicable to this category include, but are not limited to:

1) Engineering and production drawings

2) Planning, operating, maintenance, and modification instructions

3) Provisioning and facilities information

4) Technical specifications

5) Inspection, test, and calibration procedures

6) Equipment operating instructions

7) Packaging and transportation

8) Computer programs and related software

9) Audio/visual presentations and guidance in operations and maintenance of the end item.

b. Technical data are the primary means of providing for effective and standardized maintenance. The quality of these data can be evaluated by their accuracy, clarity, completeness, and responsiveness to change. Logistics test planners and test team personnel should be familiar with AFR 8-2, Air Force Technical Order System.

c. The evaluation of technical data can be accomplished by test team members on a day-to-day basis as the various publications are used. Test team personnel should participate in TO verifications. Evaluation will include identifying unsatisfactory maintenance procedures in technical data, identifying inconsistencies with general hardware TOs, and verifying that all safety requirements and warning/cautionary notes have been incorporated in the handbooks where appropriate. Bench-check-serviceable and could-not-duplicate

rates can be analyzed to determine if inadequate TOs caused or contributed to the problem. The following factors should also be considered:

1) Skill and experience level of personnel

2) Whether checklists are provided where sequential steps and the task(s) to be accomplished make them appropriate

3) Whether adequate notes, cautions, and warnings are incorporated for personnel safety and protection of equipment

4) Usefulness of the form of technical data (checklists, pocket size, etc.)

5) Adequacy of illustrations

6) Whether references to special tools and test equipment are included where needed

7) Utility of table of contents and index

8) Need for other TOs and manuals for reference to complete a task safely, correctly, or efficiently

9) Consistency in instructions, hardware, and safety provisions between related manuals

10) Adequacy of FOL and deployed requirements.

5. Test and Support Equipment.

The ability to perform maintenance and operational activities during an OT&E program is dependent upon the availability and performance of the required test and support equipment. Test/support items include tools, metrology and calibration equipment, performance monitoring and fault isolation equipment, system-peculiar handling devices, special purpose support equipment, and other equipment necessary to test or operate the end product. The CFE and GFE peculiar to or designated for use with the end item should be evaluated in terms of their capacity to sustain end item operational requirements.

a. Support equipment (SE) can generally be divided into major and minor categories, the distinction being:

1) Unit cost

2) Degree of risk

3) Estimated utilization rate

4) Dependency of program success upon GSE success

5) State of the art in design and application

6) Maintenance concepts

7) The value of the information to be obtained versus the resource expenditure required to obtain it.

b. Reliability, maintainability, and logistics supportability data can be kept on major types of SE using the maintenance data collection systems. This approach is implemented by assigning a unique identification number and serial number to each piece of equipment, which will be entered on the AFTO form 349. These entries, along with the applicable WUCs and the work center number, can provide the key data elements needed for the evaluation of reliability, maintainability, and logistics supportability of the selected pieces of equipment.

1) Quantitative reliability calculations may include:

a) MTBF in operating hours (broken down by system, subsystem, component, as appropriate)

b) MTBM in operating hours

c) MH/OH

d) MMTR.

2) Qualitative maintainability calculations may include assessments of:

a) Accessibility

b) Serviceability

c) Ease or difficulty of maintenance

d) Safety

e) Human factors.

3) Logistics supportability assessments may include the following evaluations:

a) Technical data

b) Transportation and handling equipment

c) Facilities requirements

d) Maintenance training

e) Manpower requirements

f) SE for support equipment

g) Supply support.

c. For SE that cannot be evaluated by the above techniques, one or more of the following procedures should be used:

1) Report problems on the exception principle, i.e., as the equipment is used and maintained, document the problems on a test-team developed GSE evaluation form. This procedure will normally be used for nonpowered GSE.

2) Review AFTO form 454, "Nonpowered AGE Record for Scheduled and Unscheduled Maintenance Actions"

3) Review and/or accomplish AFTO form 443, "Trainer/AGE Status and Operating Record"; and AFTO form 444, "Trainer/AGE Maintenance Record for Scheduled and Unscheduled Maintenance Actions". AFTO form 95, "Significant Historical Data", may be used as required to record cumulative data.

4) A GSE historical logbook may be kept on selected items of intermediate GSE, with the following items recorded:

a) Power-on time

b) In-commission/out-of-commission time (clock hours)

c) NORS-W time and part(s) causing NORS-W

d) LRUs tested, by serial number

e) LRU test results (go/no-go test(s) failed, etc.)

f) Calibration time (user and PMEL)

g) Corrective maintenance time (man-hours/clock hours)

h) Preventive maintenance time (man-hours/clock hours)

i) Any outside help (technical representative, etc.) required to maintain, calibrate, and set up the test set (brief description, etc.)

j) Parts consumption.

d. In conjunction with the evaluation of either type of SE, the following factors must be considered.

1) Suitability for deployment and FOL operations

2) Ease or difficulty of operation

3) Effectiveness in troubleshooting and performing diagnostic functions

4) Safety

5) PMEL requirements

6) GSE for GSE

7) Handling ease

8) Human factors

9) Susceptibility to damage

10) Inspection intervals

11) Susceptibility to contamination

12) Need for dedicated units because of nonstandard fluids

13) Braking/parking provisions

14) Towing provisions

15) Compatibility with equipment supported

16) Performance efficiency

17) Corrosion.

e. The following areas warrant special attention during evaluation, and should be reported:

1) GSE demonstrating poor MTBR, MTBM, or excessive MH/OH

2) Excessive MMTR

3) Problems with accessibility, serviceability, difficulty of maintenance, safety, and human factors.

f. Logistics supportability assessments will be made of technical data, transportation and handling equipment, facilities requirements, maintenance training, manpower requirements, GSE for GSE, and supply support, and problems reported.

6. Support Facilities.

a. Support facilities encompass the physical plants necessary to sustain the operation of an end item. Facility type, location, space requirements, environment, and usage are based on engineering, operational, and maintenance requirements as defined by specifications, end item design, and other related factors. AFM 86-2,"Standard Facility Requirements", may be useful for evaluating additive facility requirements.

b. Elements to be considered in evaluating support facilities include, but are not limited to:

1) Base expansion in terms of runways, communications, traffic control, launch facilities, security and utilities (e.g., electricity, water, compressed air, heating and ventilation, sewers and drainage).

2) Engine test cells, including location

3) Run-up pads and sound suppressors, including location

4) Fuel cell docks and repair shops

5) Hangar and maintenance-shop floor space

6) Special maintenance facilities that are end-item peculiar

7) Simulators and other training aids

8) Wash racks, corrosion control facilities, hoists, boresight/alignment facilities, inspection docks

9) Weapon storage, handling, routing, holding area, and security programs; trucks, trailers and hauling equipment; war reserve spares kit (WRSK) storage

10) Construction scheduled and end item initial operational capability (IOC)

11) Projected utilization rate

12) Average sortie length

13) Average number of engine changes per month, scheduled and unscheduled

14) Number of aircraft per squadron, and squadrons per wing

15) PME authorizations

16) Total SE authorized per unit by type

17) NDI facility requirements

18) Clean room requirements

19) Maintenance requirements

20) Inspection requirements

21) Corrosion control requirements

22) Proposed unit detail listing (UDL)

23) Projected fuel cell requirements

24) FOL and deployment requirements.

7. Training.

a. Objectives of a training program are to provide trained personnel with specific skills and training equipment that will support an end item through its life cycle. Support specialties and skill levels required to perform base-level tasks, as well as the need for new or unique specialties, are usually defined in the personnel requirements portion of the maintenance plan. Training of personnel to meet these requirements will depend on such factors as:

1) The availability of support specialties and skill levels within the Air Force.

2) System-unique characteristics that require new specialties or training to support end item maintenance and operations.

b. The qualitative evaluation should assess the adequacy of the training prior to OT&E, as well as the technical and management-oriented training by specialty that is necessary to support the operational end item. The evaluation includes a determination of the need for factory training by a contractor (Type I), the quality and quantity of formal classroom instruction at Air Training Command (ATC) centers (Types II and III), training that can be accomplished on base by an ATC field detachment (Type IV), and other training (Type V) which may involve intraservice training. Factors for assessing training can be found in the following types of documentation.

1) Personnel equipment and subsystems test and evaluation (PSTE) reports

2) Human factors engineering and management studies (see AFR 800-15)

3) Qualitative and quantitative personnel requirements information (QQPRI) lists.

c. The qualitative assessment of training will depend on the observations, experience, and judgment of ATC and using command personnel participating in training and OT&E. The importance of these experience and judgment factors cannot be overemphasized. The main objectives of the training assessment in OT&E must include:

1) Determining the adequacy of maintenance training

2) Validating training, equipment, media, and facilities requirements

3) Evaluating the adequacy of type 4 course control documents

4) Evaluating attrition and conversion training requirements.

8. Initial and Replacement Spares.

This parameter is usually evaluated as an element of supply support. Because of its importance to an OT&E program, it has been listed separately. The significance of this parameter results from its direct impact on an OT&E program. Without adequate repair and spare parts, significant delays can occur. Some factors that influence quantities of initial and replacement spares include, but are not limited to:

a. Equipment design

b. Operationally ready rate requirements

c. Equipment reliability

d. Maintenance concept

1) Repair levels (organizational, intermediate, depot)

2) Repair versus discard of modules

3) Remove and replace versus remove and repair

4) Support equipment and facilities available for OT&E.

e. Available technical documentation.

For additional information concerning this parameter refer to AFM 67-1, USAF Supply Manual.

9. Configuration Management.

a. The configuration management effort presents a series of design baselines that provide orderly transition from one decision point to the next in the design, development, and evaluation of an end item. Configuration management interfaces with logistics through the development of technical data that affects the planned logistics support resources. As the configuration baselines are refined, the logistics baseline must be adjusted. The logistics support delivered to sustain operational equipment must be adjusted to match the product baseline that exists at the time the equipment is put into OT&E. Subsequent configuration management decisions will usually impact the logistics support system.

b. This parameter should be evaluated in terms of how well the logistics resources support the configuration under test. The interactions among the various supportability parameters will influence the qualitative assessment of configuration management adequacy. Since each program will be different, so will the qualitative criteria. For each OT&E program the criteria must be established by the similarity and differences of the test item to end items in the inventory.

c. Paragraph 4-3a(4) provides an overview of configuration management and lists documents pertaining to the subject that should be used in establishing criteria for the evaluation of this qualitative parameter.

(4) Additional parameters that may also require qualitative assessments are presented in table 4-6a. These parameters are generally considered as qualitative subobjectives of the maintainability analysis portion of testing. They support and are supported by the quantitative maintainability objectives. The following paragraphs provide a discussion of each of these listed parameters.

(a) Accessibility of Parts, Test Points, Adjustments, and Connections. Maintenance performed during testing should be evaluated by the technician performing the task. Problems related to maintainability, equipment design, installation, accessibility, location, or servicing should be identified by test team members and documented on a locally designed maintainability evaluation form. These forms can be filed by WUC and used as reference documentation in the preparation of deficiency reports. Emphasis should be placed on identifying the human factors in equipment designs that may lead to maintenance errors and hazardous conditions, such as electrical leads that can be reversed; fittings that are co-located and could be attached to the wrong connection; sharp edges; blind spots; exposed electrical contacts; etc. For problems in such characteristics as accessibility, location, and servicing, which cause excessive

TABLE 4-6a. QUALITATIVE PARAMETERS

1.	Accessibility of parts, test points, adjustments, and connections.
2.	Test instrumentation effects on end item performance.
3.	Accessibility/adaptability for in-flight maintenance.
4.	Design-dictated or permitted preventive maintenance actions.
5.	Proliferation of special maintenance tools.
6.	Susceptibility to incorrect maintenance actions.
7.	Susceptibility to damage.
8.	Adequacy of safety and protective equipment.
9.	Adequacy of standardization and interchangeability features.
10.	Adequacy of security.
11.	Adequacy of fail-safe design features.
12.	Adequacy of corrosion prevention and control.
13.	Adequacy of time change procedures.
14.	Inspection criteria.
15.	Adequacy of post-maintenance operational check.
16.	Special handling criteria.
17.	Size and weight limitation criteria.
18.	Environmental extreme criteria.
19.	Weapon load criteria.
20.	Alignment and calibration criteria.
21.	Cyclic operation/duration limits criteria.
22.	Mission variation criteria.
23.	Human factors engineering.

man-hours to be expended or excessive downtime, stopwatch measurements should be made to determine the time(s) for the total task and the portion of that time which can be attributed to the problem in question. Problems with accessibility, and serviceability can be related by WUC to excessive MH/FH, MMTR, etc. Once a task is identified as consuming excessive maintenance time because of accessibility or location problems, the test team should calculate, by the most suitable means appropriate, that portion of the task time attributable to the faulty design or installation characteristic(s). This time can then be subtracted from the present task interval to determine the amount of time that could be saved by redesign. These data are then used in conjunction with cost-of-ownership calculations to evaluate the cost impact of a redesign in terms of savings from an improved maintenance standpoint.

(b) Test Instrumentation Effects on End Item Performance. The utility of this parameter is to ensure that the possible effects of test instrumentation have been isolated from the end item. If isolation cannot be accomplished, these effects must be known and controlled. Typical examples are excessive power drain when test instrumentation uses end item power; a variety of problems associated with telemetry equipment, ranging from signal interference to inaccurate data transmissions; and effects on test data accuracy caused by computer controlled test equipment and the interactions between test equipment and end item.

(c) Accessibility/Adaptability for In-Flight Maintenance.

1. In selected cases, some limited type of in-flight maintenance may be practical. For example, in multi-manned aircraft, spare LRUs may be carried in accessible electronics racks to permit in-flight removal and replacement of failed items during a mission. The access to and the resetting of circuit breakers for flight-critical equipment may also be necessary.

2. In other instances the performance of actual in-flight maintenance may not be a factor in evaluating an aerospace vehicle. However, manual switching from primary to backup or emergency systems may be critical to flight safety. The controls for performing these switching functions must be readily available to the pilot. Built-in test equipment displays should be easily read so that the pilot can assess the extent of the indicated malfunction and implement any corrective actions available to him.

(d) Design Dictated or Permitted Preventive Maintenance Actions. The purpose of evaluating this parameter is to determine the adequacy of the actions established for the preventive maintenance program. Preventive maintenance comprises those actions performed on a regular basis (time, miles, cycles, events) to assure that an end item has not deteriorated below some acceptable operating condition. Periodic inspections, lubrication, checks for worn or damaged parts, and scheduled replacement of parts and equipment before failure are some of these actions. Additionally, where status monitoring equipment is utilized, the validity of established limits for maintenance should be verified, as should the limits and tolerances specified in the technical data. Methods should be explored for reducing servicing and maintenance costs through approaches that are equally safe but more efficient.

(e) Proliferation of Special Maintenance Tools. This parameter is associated with the quantities of special tools required to perform maintenance actions on a specific end item. Requirements for special tools may affect the level (organizational, intermediate, depot) at which the maintenance actions can be performed. In turn, these levels impact on the overall maintenance concept. Actions that could be performed at the organizational level may require moving to intermediate or depot levels, depending on the necessary tools and their locations. The utility of this parameter is in reviewing the maintenance actions, the types and quantities of special tools developed, their applications and locations, and identifying possible changes or techniques in maintenance that may reduce their numbers.

(f) Susceptibility to Incorrect Maintenance Actions. This parameter provides an assessment of the design with respect to malfunctions or failures induced by maintenance actions, and is used as the example presented in subsection 4-6c.

(g) Susceptibility to Damage. This parameter provides an assessment of a design with respect to possible damage from sources external to the item. Typical elements to be considered include the type, location, and adequacy of handles and hoist attachment points; the size and weight of the item and its height above ground; the number of personnel assigned for removal and/or installation of the item; clearances between the item and access panels or doors; the proximity of other hardware items, and their possible interference during removal or installation; packaging of the item including extensions such as lugs or fittings beyond the basic dimensions of the item; mounts incorporated for shock reduction or isolation; gaskets, seals, and covers required for weather proofing; and containers supplied for transporting, shipping, and storage of the item.

(h) Adequacy of Safety and Protective Equipment. This parameter covers a broad spectrum of areas that may require evaluation. Included are crew station, arresting, protection, fire extinguisher/suppression, crash protection and escape/survival, hazard detection and warning, and life support systems. AFSC has developed a series of design handbooks covering the design and safety aspects of these and other systems. Valuable information applicable to this parameter are provided by AFSC Design Handbook (DH) 1-6, System Safety, DH 2-2, Crew Stations and Passenger Accommodations, DH 1-X, Checklist of General Design Criteria, and DH 2-X, Checklist for Aeronautical Systems. These handbooks should be used when developing evaluation criteria and preparing evaluation sheets.

(i) Adequacy of Standardization and Interchangeability. A relative measure of the degree of standardization utilized in a design may be obtained by comparing the quantities of government standard and stocked articles or the number of new and unique articles with the total articles used in an item. These comparisons may be made at the assembly, subsystem, system, or end item level. The use of government standard and stocked items also impacts on interchangeability. However, interchanageability includes other factors, such as utilizing the same configuration, utilizing existing hardware to perform new

or different functions that are within its design capabilities, utilizing standard mounting hardware and connections for equipment, and reducing the requirements for special plumbing by using flexible lines and hoses.

(j) Adequacy of Security. This parameter is associated with the protection of classified equipment designs and the prevention of unauthorized use of that equipment. Both of these aspects of security must be evaluated. Elements to be considered include the importance of the equipment to national security; the physical installation and accessibility of the equipment; provisions for locks, control of access keys, and the suitability of warning devices; the authorization and control of personnel to access/operate the equipment; and the availability of secure areas for maintenance performance.

(k) Adequacy of Fail-Safe Design Features. This parameter may be evaluated as part of the safety effort. However, it is addressed separately because of its influence on equipment design. Some typical items to be considered include the capability of extending the landing gear after a hydraulic failure; disarming and securing or jettisoning weapons after an electrical failure; jettisoning fuel if excess weight is a problem prior to an emergency landing; manually overriding automatic fuel management systems; manually switching to emergency electrical power when primary sources fail; and reducing power consumption to a minimum during flight emergency conditions.

(l) Adequacy of Corrosion Prevention and Control. This parameter provides an assessment of the end item design with respect to retaining structural and operational integrity in those areas where corrosion and/or electrolytic action may occur. Elements to be considered include the use of protective coatings; their suitability and ease of application; the presence and locations of drain holes to prevent moisture entrapment; the isolation of and protection between dissimilar metals; accessibility of possible corrosion areas for inspection; the location, design, and isolation features of battery compartments; the use of solvents and frequency for washing/cleaning; and provisions for wash racks, facilities, etc., required for corrosion control.

(m) Adequacy of Time Change Procedures and Inspection Criteria. Both of these parameters are linked to the failure or malfunction expectancies of hardware and the relative risks associated with these malfunctions or failures. Some malfunctions or failures may always result in the loss or destruction of an end item. Others may contribute to degraded performance, and still others may present only nuisance-type problems. In assessing these two qualitative parameters, it is important to identify the criticality of failures or malfunctions with respect to their impact on end item operation. Then each parameter is evaluated in terms of its potential for discovering, reducing, or preventing those types of failures.

(n) Adequacy of Post-Maintenance Operational Check. Generally, this item would be included as part of the evaluation of susceptibility to incorrect maintenance actions (para. 4-6a(4)(f). However, it is listed separately because it may require a specific assessment. The technical documentation, checkout procedures, input-output characteristics and tolerances, seals, fasteners,

lubrication, external wiring and connectors, and bleeding and purging are some of the elements to be considered in evaluating the adequacy of checkout procedures that verify the sufficiency of the maintenance performed. A further breakdown between on-equipment and off-equipment operational checkout may also be required.

(o) Special Handling Criteria and Size and Weight Limitations. While these two items are normally considered during the evaluation of susceptibility to damage, para. 4-6a(4)(g), they are listed separately here as possible parameters requiring specific assessments. Special handling criteria include items such as packaging and preservation for handling and transportation, shelf life, controls for protecting classified equipment, environmental and shock load protection during shipment and storage, and susceptibility to contamination. Size and weight limitation criteria include maximum length, width, and depth; maximum weight; end item structure available to support hardware; size of space and clearances provided for removal and installation of hardware; and equipment and crew necessary to remove and install hardware.

(p) Environmental Extremes Criteria. During the evaluation of this parameter, both natural and man-made environments must be considered. Natural environment includes such factors as temperature, atmospheric pressure, humidity, rain, snow, sand and dust, and wind. The man-made environment includes temperature, altitude, acceleration, pressure, and mechanical and acoustic vibrations.

(q) Weapon Load Criteria. These criteria dictate the types of specialists, crew sizes, and number of crews required to perform the weapon loading functions. Factors to be considered when evaluating this parameter include the diversity of armaments to be serviced, loading sequences, sortie turnaround time, weights of individual stores to be loaded, available equipment for stores transportation and handling, repetition of tasks and fatigue factors, maximum number of personnel that can effectively work in the loading area, personnel and equipment safety regulations, hazards associated with the different types of stores, and security requirements associated with classified weapons.

(r) Alignment and Calibration Criteria. Elements to be considered in evaluating this parameter include the physical characteristics of the precision measurement equipment, including packaging, size, weight, cables and probes, and ancillary equipment; traceability to appropriate reference standards; alignment and calibration intervals and certification requirements; operational environmental tolerances; storage, handling and transportation requirements; calibration measurement requirements and restrictions; applicable technical orders and calibration procedures; alignment and calibration responsibilities; personnel technical skills and proficiency requirements; and security requirements and restrictions for classified equipment.

(s) Cyclic Operation/Duration Limits Criteria. Test and checkout of selected equipment usually requires the presence of system power. In many instances the application of power activates the complete system. Under

these conditions, even when only a portion of the system is under test, the complete system is accumulating operating time and is subject to failures. Additionally, power-on test situations may cause excessive temperature buildup and result in malfunctions or failures in portions of the system not being tested. Special instructions for additional cooling, cycling, or time limits may be required for power-on test situations. The system design may be such that portions of the system may be isolated or rendered inoperative when not being tested. The purpose of this parameter is to identify the possible adverse effects that testing may have on the hardware, and the adequacy of the preventive measures implemented for equipment protection during power-on testing.

(t) Mission Variation Criteria. Multi-mission capabilities are generally provided by using different types and/or combinations of on-board end item hardware. The purpose of this parameter is to assure that those subsystems operating during each mission have been identified. The development of a matrix showing missions versus equipment requirements is one method of evaluating this parameter. The matrix also has the advantage of providing a method for identifying alternate or reduced mission capabilities. Based on the status of hardware at any point in time, the missions that are still possible can be identified. Care must be taken in using this approach, because the practicality of reduced capabilities may be exceeded.

(u) Human Factors Engineering (HFE). HFE is concerned with those tasks required to provide effective human performance in a system. It comprises that portion of systems optimization associated with the human performance necessary to operate, maintain, support, and control the system in its intended operational environment. The elements comprising HFE include human engineering, biomedical, manpower and personnel requirements, and training. Because there are overlaps among disciplines, three of these elements have been previously discussed. Training and personnel requirements were covered under ILS, and the majority of biomedical items were presented under safety and protective equipment adequacy.

1. Human engineering is the application of knowledge concerning human capabilities and limitations to equipment or system designs such that desired results can be achieved through the most effective use of man's performance capabilities.

2. Items to be considered when evaluating human engineering include, but are not limited to:

a. Vision, which involves field-of-view visual range requirements; windshield materials and coatings; defogging/cleaning provisions; clearance, deviation, distortion and glare; seats and seating arrangements; approach and landing paths; and landing and delivery areas.

b. Static and dynamic anthropometrics, which includes size, shape, and motion characteristics of crew members.

c. Equipment layout, which involves panel heights and sizes; types, sizes, and locations of displays; lighting; size, shape and location of controls; and left-hand and right-hand operational tasks.

d. Operator workload, which refers to the effects on the human operator generated by the multiple stresses resulting from the man-machine operating environment.

3. Of primary concern are those design features that could either impact on operator or technician safety, introduce operator or technician error, or increase maintenance task time. MIL-STD-1472 (9 February 1968) contains specific questions to be answered during a human factors evaluation. Those sections of the Mil standard that specifically apply to the item or system being evaluated should be reviewed for all items or systems evaluated; those sections of the Mil standard covering labeling, anthropometry, environment, and hazards and safety should be referenced. To evaluate the above cited factors, a checklist tailored to the system of interest should be developed by the test team. The following questions can serve as a general guide in developing such a list:

a. Are major LRUs centrally located to facilitiate total system inspection/checkout/troubleshooting?

b. Does system design/installation contribute to ease of maintenance in terms of location, accessibility, etc. ? Consider:

1) Size of access panels/doors, and number of and type of fasteners.

2) Size and weight of components, adequacy of handles or handholds, required span of reach, and height above or distance from work surface.

3) Location of test or servicing points in relation to work surface for test or servicing equipment.

4) Adequacy of space for necessary support equipment.

c. Are test or servicing points clearly marked to reduce chance of induced error?

d. Are connectors of different sizes keyed or clearly marked to eliminate swapping?

e. Are connectors visible and readily accessible to reduce chance of cross-threading, etc. ?

f. Are there hazards in terms of blind spots, sharp edges, or exposed electrical connectors/circuitry?

g. Can the system be checked out (operational check, troubleshooting, etc.) by not more than two technicians?

h. Are support equipment/BITE cues and indications easily read and understood?

i. Does system operation create/involve adverse environmental conditions such as noxious fumes, high noise levels, extreme temperatures, exhaust blast, etc.? Conversely, does system maintenance require facilities or SE for heating/cooling, lighting, ventilation, etc.?

j. What additional features or requirements, not listed above, adversely affect system maintenance? (Refer to MIL-STD-1472.)

(5) The importance of utilizing test team personnel with a wide variety of maintenance experience cannot be overemphasized. Much of the value derived from evaluating qualitative parameters will depend on the background and experience of those individuals developing the questionnaires, collecting the information, and performing the subjective analyses of that information. To obtain objectivity, the group collecting the information should consist of personel other than those developing the questions and analyzing the information.

b. Test Situations Requiring Qualitative Evaluations.

(1) Initial Operational Test and Evaluation represents a unique phase in the development cycle of an end item. At this stage, only preproduction or prototype hardware usually exists. Many final decisions concerning the production hardware have not been made. Additionally, technical data, support and test equipment, training, supply support, and a variety of other elements essential to end item operations may be minimal or nonexistent. Judgment factors will play a critical role in performing any type of evaluation. From an AFTEC standpoint, all elements are critical to the results obtained from the test and evaluation process.

(a) Requests for proposal (RFPs), responses to RFPs, engineering change proposals (ECPs), maintenance plans, support concepts, and other documents that define or describe end item operation and support will have to be reviewed. This review will at least indicate what has been planned for the end item. Even with these documents available, it may not be possible to investigate some parameters.

(b) The evaluation process may require the drawing of inferences between the logistics elements provided for the IOT&E hardware and those that will be provided for the operational system. Steps can be implemented during IOT&E to obtain some degree of assurance that existing and planned logistics elements for the new end item will be adequate.

(2) A series of steps that provide a systematic approach for evaluating these elements are listed below. All steps may not be required for a given IOT&E program.

(a) From program documentation, identify the logistics elements necessary to operate and support the new end item.

(b) Determine those elements that can be evaluated quantitatively, and those requiring qualitative assessments.

(c) Identify those elements that can be evaluated during IOT&E.

(d) Establish whether the IOT&E-evaluated elements will be quantitative or qualitative in nature.

(e) Identify the quantitative parameters and proceed as outlined in sections 4-2, 4-3, and 4-4.

(f) Identify the qualitative parameters, establish their evaluation criteria, and perform the evaluation.

(g) Identify those elements that cannot be evaluated during IOT&E.

(h) Review available information concerning the overall operation and support of a similar existing end item.

1. Develop assumptions concerning the relative adequacy of logistics elements for the new end item, based on similarities and differences between the two end items.

2. Compare the quantitative and qualitative elements of the new end item with similar elements for the existing end item.

3. Evaluate the adequacy of the remaining logistics elements for the new item in terms of the adequacy of those elements applied to the existing end item.

(3) As the program progresses, Follow-On Test and Evaluation (FOT&E) is usually implemented. This phase of testing is also conducted in an operational environment but with production end items. The purpose of FOT&E is to verify operational effectiveness and suitability; and to provide information on organization, personnel, doctrine, and tactics. It is also conducted to determine if production techniques have affected system performance, operational suitability, and logistics concepts. In some instances it may not be possible to adequately evaluate all logistics elements until FOT&E is implemented.

c. Application of the Qualitative Process.

The following discussion expands on the general approach to qualitative evaluations presented in para. 4-6a(2). The qualitative parameter "susceptibility to incorrect maintenance actions" will again serve as the example. This parameter is defined as any on-equipment or off-equipment actions causing damage to or the malfunction or failure of an item as the result of performing preventive or corrective maintenance.

(1) The types of questions associated with maintenance actions will depend on the end item being tested. Aircraft will require certain types, CEM will require other types, and ground-launched missiles will require even different types. For illustrative purposes, an aircraft will be used. In this instance, questions must be formulated for both on-equipment and off-equipment actions. Typical questions associated with on-equipment actions may include:

(a) Are handles, surfaces, and hoist attachment points adequate for removal/transfer of equipment?

(b) Are areas clearly marked where weight can and cannot be applied (e.g., "No Step", "Use as Hand Holds", "Not an Attachment Point for Lifting", etc.)? Are provisions available where required?

(c) Can equipment removal or in-place maintenance actions damage hydraulic/pneumatic lines or associated hardware?

(d) Can loose or unanchored equipment damage, break, jam, or short surrounding hardware? Can loose hardware be retrieved?

(e) Are mechanically actuated limit switch adjustments critical with respect to actuator overtravel? Are they environmentally sealed?

(f) Does the removal of equipment from the aircraft require special tools and/or fixtures to prevent damage to surrounding hardware? Are these tools readily available?

(g) Can hydraulic/pneumatic actuators be disconnected when the system is pressurized?

(h) Will excessive amounts of lubricant cause seal leakage/damage? Equipment damage?

(i) Can flight surfaces (spoilers, ailerons, flaps, etc.) be damaged by movement to extreme positions when actuators are disconnected?

(j) Are wire bundles/cables protected against damage when maintenance is being performed near their locations?

(k) Are chafing blocks/strips an integral part of the structure so that they will always be replaced when removal and reinstallation of hydraulic/pneumatic lines are required?

(l) Are hydraulic/pneumatic flexible hoses long enough to allow the plumbing of an actuator to be reversed?

(m) Will a hydraulic bleed valve completely drain the system if inadvertently left open?

(n) Are dust or screw caps provided to seal off all bleed valves?

(o) Can LRUs be installed in such a manner that they will be inoperative?

(p) Can the improper securing of fasteners (lockwire, washers, lock nuts, etc.) cause the equipment they anchor to become inoperative/damaged?

(2) Questions may also be required to address specific items or locations on the aircraft such as engines, landing gear, control systems, cockpit, fuselage, etc.

(3) Typical questions associated with off-equipment actions may include:

(a) Are mechanical items designed so that assembly can be accomplished only when the part's orientation is correct?

(b) Will the assembly of mechanical parts in a backward, upside down, or reversed direction affect operation of the item? Are wires coded for proper connector installation?

(c) Does the removal of parts require special tools or fixtures to prevent damage to surrounding hardware? Are these tools readily available?

(d) Are plugs and connectors keyed so that interchange is not possible?

(e) Can circuit cards be installed backwards?

(f) Can circuits be overstressed by voltages applied at test points?

(g) Can the use of electrical probes short or damage surrounding electronic parts?

(h) Can loose parts internal to an LRU short, damage, break, or jam surrounding components?

(i) Can the omission of parts (electronic, mechanical, and other) be easily detected?

(j) If part substitutions are made, will they change the output characteristics of the LRUs?

(4) Once the questions have been generated, the next step is to develop a formatted evaluation sheet. The process of generating questions and developing evaluation sheets is repeated for each qualitative parameter of interest. Figure 4-6a presents a typical evaluation sheet based on the questions presented in para. 4-6c(1).

Page ___ of ___

End Item Name ________________ Serial Number ________________

Observations Made by ________________ Date ________________

Test Program ________________

Location ________________

Parameter ________________

	No	Partially	Yes
1. Are handles, surfaces, and hoist attachment points adequate for removal/transfer of equipment?			
2. Are areas clearly marked where weight can and cannot be applied (e.g., "No Step," "Use as Hand Holds," "Not an Attachment Point for Lifting," etc.)? Are provisions available where required?			
3. Can equipment removal or in-place maintenance actions damage hydraulic/pneumatic lines or associated hardware?			
4. Can loose or unanchored equipment damage, break, jam, or short surrounding hardware? Can loose hardware be retrieved?			
5. Are mechanically actuated limit switch adjustments critical with respect to actuator overtravel? Are they environmentally sealed?			
6. Does the removal of equipment from the aircraft require special tools and/or fixtures to prevent damage to surrounding hardware? Are these tools readily available?			
7. Can hydraulic/pneumatic actuators be disconnected when the system is pressurized?			
8. Will excessive amounts of lubricant cause seal leakage/damage? Equipment damage?			
9. Can flight surfaces (spoilers, ailerons, flaps, etc.) be damaged by movement to extreme positions when actuators are disconnected?			
10. Are wire bundles/cables protected against damage when maintenance is being performed near their locations?			
11. Are chafing blocks/strips an integral part of the structure so that they will always be replaced when removal and reinstallation of hydraulic/pneumatic lines are required?			
12. Are hydraulic/pneumatic flexible hoses long enough to allow the plumbing of an actuator to be reversed?			
13. Will a hydraulic bleed valve completely drain the system if inadvertently left open?			
14. Are dust or screw caps provided to seal off all bleed valves?			
15. Can LRUs be installed in such a manner that they will be inoperative?			
16. Can the improper securing of fasteners (lockwire, washers, lock nuts, etc.) cause the equipment they anchor to become inoperative/damaged?			

Notes:

Overall Evaluation and Comments ________________

Adequate	
Marginal	
Unsatisfactory	

Reviewed by: ________________

Approved by: ________________

Figure 4-6a. Qualitative Parameter Evaluation Sheet

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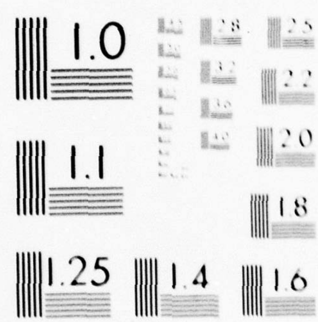

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

(5) Each formatted evaluation sheet should be reviewed with respect to its contents and requirements. Typically, the review should include an assessment of the overall questionnaire as well as the individual questions.

(a) With respect to the evaluation sheet, all answers to the following questions should be affirmative. If not, consideration should be given to restructuring or limiting its information content.

1. Are instructions as brief and uncomplicated as possible?

2. Is the length of the questionnaire reasonable?

3. Does each question stand on its own merits?

4. Is the amount of writing required of the recipient reasonable and held to a minimum?

5. Does the physical appearance of the questionnaire convey the impression that it is important?

(b) For each question on the evaluation sheet, the following checklist should be applied. Unless every answer is affirmative, the question should be rewritten or perhaps even deleted.

1. Is the scope of the question limited such that the recipient can decide which personal experience is relevant to his answer?

2. Is the topic of the question relevant to the test program?

3. Is the question limited to only one topic or idea?

4. Is the wording of the question clear and precise?

5. For multiple choice items, are the choices mutually exclusive, distinct, and separate?

6. Have lengthy lists of items that must be ranked according to preference been avoided?

7. Have leading questions that may bias the recipient been avoided?

8. Will the answer to a question provide the intended information?

(c) The final step in developing the formatted evaluation sheet is the preparation of instructions for completion of that sheet. Relatively few instructions may be needed if the sheet has been made self-explanatory. It may be necessary for the recipient to identify the basis for answers in terms of his background, training, and experience. Other factors that can influence the

answers to questions may also need identification. The instructions should be straightforward and as simple as possible, describe the utility of the evaluation sheet, present its intended applications, and provide the necessary information for completing the sheet.

CHAPTER 5

LOGISTICS ASSESSMENT APPLICATIONS

(To be developed.)

CHAPTER 6

STANDARD AIR FORCE R&M TERMS

(To be developed.)

CHAPTER 7

SUPPLEMENTAL INFORMATION

The majority of backup information for this document is presented as appendixes in Volume II. This chapter provides the supplemental information considered necessary for regular use of the document. Section 7-1 presents a listing of acronyms and abbreviations appearing herein. Section 7-2 provides a consolidation of terms and definitions. Section 7-3 delineates the references utilized in preparing this document, and thus provides additional information on subjects covered herein.

7-1. ACRONYMS AND ABBREVIATIONS.

ACMS – Advanced Configuration Management System

ADC – Air Defense Command

ADPE – Automatic Data Processing Equipment

ADS – Automated Data System

AFLC – Air Force Logistics Command

AFM – Air Force Manual

AFO – Accounting and Finance Office

AFR – Air Force Regulation

AFSC – Air Force Systems Command (Air Force Specialty Code)

AFTEC – Air Force Test and Evaluation Center

AGE – Aerospace Ground Equipment

ALC – Air Logistics Center

AMTS – Active Man-Hour Task Summary

APU – Auxiliary Power Unit

ASD – Air Systems Division

ATC – Air Training Command (Action Taken Code)

AU – Aircraft Utilization

AWP – Awaiting Parts

BIT	–	Built-In Test
BLIS	–	Base Level Inquiry System
BFA	–	Before Flight Aborts
CEI	–	Configuration End Item
CEM	–	Communication - Electronic-Meteorology
CFE	–	Contractor Furnished Equipment
CI	–	Configuration Item
CND	–	Could Not Duplicate
CSAF	–	Chief of Staff of the Air Force
DCP	–	Decision Coordinating Paper (Development Concept Paper
DEN	–	Data Element Name
DID	–	Data Item Description
DIDS	–	Defense Integrated Data System
DIFM	–	Due In From Maintenance
DoD	–	Department of Defense
DPD	–	Data Products Directive
DR	–	Demand Rate; Deficiency Report
DSA	–	Depot Supply Activity
DSARC	–	Defense Systems Acquisition Review Council
DT&E	–	Development, Test, and Evaluation
ECMS	–	Engine Configuration Management System
ECP	–	Engineering Change Proposals
EI	–	End Item
EOC	–	Equipment Operating Cycle
EOD	–	Explosive Ordnance Disposal (Team)
ERRC	–	Expendability, Recoverability, Repair Category

ESR	–	Equipment Status Reporting (System)
ETA	–	Exception Time Accounting
ETI	–	Elapsed Time Indicator
ETIC	–	Estimated Time in Commission
EUMR	–	Emergency Unsatisfactory Materiel Reports
FAD	–	Force/Activity Designator
FCF	–	Functional Check Flight
FCS	–	Federal Supply Class
FH	–	Flight Hours
FI	–	Failed Item
FIIN	–	Federal Item Identification Number
FLU	–	First Line Unit
FOD	–	Foreign Object Damage
FOL	–	Forward Operating Location
FSC	–	Federal Supply Classification
FOT&E	–	Follow-on Operational Test and Evaluation
FUD	–	File Update
GFE	–	Government-Furnished Equipment
GSE	–	Ground Support Equipment
HFE	–	Human Factors Engineering
IFA	–	In-Flight Aborts
II	–	Installed Item
ILS	–	Integrated Logistics Support
ILSP	–	Integrated Logistics Support Plan
IM	–	Item Manager
IOC	–	Initial Operational Capability
IOT&E	–	Initial Operational Test and Evaluation
IROS	–	Increase Reliability of Operational Systems
ISSL	–	Initial Spares Support List
JEIM	–	Jet Engine Intermediate Maintenance
LAP	–	Logistics Assessment Plan

LCC	–	Life Cycle Cost
L-COM	–	Logistics Composite Model
LE	–	Logistics Effects
LG	–	Directorate of Logistics
LPF	–	Logistics Performance Factors
LRU	–	Line Removable Unit (Line Replaceable Unit)
LSA	–	Logistics Support Analysis
LSC	–	Logistic Support Costs
LSET	–	Logistics Supportability Evaluation Team
MAC	–	Military Airlift Command
MADT	–	Mean Active Down Time
MAJCOM	–	Major Command
MAR	–	Minimum Acceptable Reliability
MCS	–	Maintenance Cost System
MDCS	–	Maintenance Data Collection System
MDS	–	Mission, Design & Series
MEA	–	Maintenance Engineering Analysis
MEAR	–	Maintenance Engineering Analysis Records
MH/FH	–	Maintenance Man-Hours per Flight Hour
MH/OH	–	Maintenance Man-Hours/Operating Hour
MIICS	–	Master Item Identification Control System
MISEDS	–	Machine Independent Systems Effectiveness Data System
MLE	–	Measured Logistics Effects
MLF	–	Maintenance Load Factor (Man Hours/Flight Hours)
MMICS	–	Maintenance Management Information and Control System
MMTR	–	Mean Man-Hours to Repair

MOB	–	Main Operating Base
MOE	–	Measures of Effectiveness
MOM	–	Measures of Merit
MRT	–	Maintainability Review Team
MTBD	–	Mean Time Between Demand
MTBF	–	Mean Time Between Failure
MTBM	–	Mean Time Between Maintenance (Actions)
MTBR	–	Mean Time Between Removals
MTT	–	Mean Task Time
MTTR	–	Mean Time to Repair
NDI	–	Non-Destructive Inspection
NIIN	–	National Item Identification Number
NOC	–	Not Otherwise Coded
NORM	–	Not Operationally Ready Maintenance
NORS	–	Not Operationally Ready Supply
NORS-W	–	SE Out of Commission
NRTS	–	Not Repairable This Station
OA	–	Directorate of Analysis
OCALC	–	Oklahoma City Air Logistics Center
OFM	–	Organization Field Maintenance
OFMDR	–	Organization Field Maintenance Demand Rate
OMB	–	Office of Management and Budget
OOALC	–	Ogden Air Logistics Center
OR	–	Operationally Ready
ORLA	–	Optimum Repair Level Analysis
OTU	–	Operating Time Update
OWC	–	Owing Work Center
PCN	–	Product Control Number
PCR	–	Publication Change Request
PDM	–	Programmed Depot Maintenance
PEC	–	Program Element Code
PER	–	Premature Engine Removals

PESTE	–	Personnel Equipment & Subsystem Test & Evaluation
PMD	–	Program Management Directive
PME	–	Precision Measuring Equipment
PMEL	–	Precision Measuring Equipment Laboratory
PMP	–	Program Management Plan
POL	–	Petroleum, Oil, and Lubricants
PRR	–	Premature Removal Rate
PSTE	–	Personnel Subsystems Test and Evaluation
PWC	–	Primary Work Center
QPA	–	Quantity Per Application (Quantity Per Article)
QPPRI	–	Qualitative and Quantitative Personnel Requirements Information
QUMR	–	Quality Unsatisfactory Materiel Reports
RAC	–	Reliability Analysis Center
RCS	–	Report Control Symbol
RFP	–	Request for Proposal
ROC	–	Required Operational Capability
R&M	–	Reliability and Maintainability
RPIE	–	Real Property Installed Equipment
RTS	–	Repaired This Station
RUMR	–	Routine Unsatisfactory Materiel Reports
SAALC	–	San Antonio Air Logistics Center
SAC	–	Strategic Air Command
SAMSO	–	Space and Missile Systems Organization
SBSS	–	Standard Base Supply System
SCMS	–	Standard Configuration Management System
SE	–	Support Equipment
SEDS	–	System Effectiveness Data System
SIOP	–	Single Integrated Operational Plan
SISMS	–	Standard Integrated Support Management System
SM	–	System Manager
SMALC	–	Sacramento Air Logistics Center

SMR	–	Source Maintenance Recoverability (Code)
SOA	–	Separate Operating Agency
SPO	–	System Program Office
SRD	–	Standard Reporting Designator
SRU	–	Shop Removable Unit (Shop Replaceable Unit)
TA	–	Table of Allowances
TAC	–	Tactical Air Command
TBO	–	Time Between Overhaul
TCTO	–	Time Compliance Technical Order
TD	–	Test Directive
TDR	–	Teardown Deficiency Report
TEOA	–	Test and Evaluation Objectives Annex
TMS	–	Type, Model, Series
TO	–	Technical Order
TP	–	Test Plan
TPO	–	Transportation Packaging Orders
UDL	–	Unit Detail Listing
UMR	–	Unsatisfactory Materiel Report
WAC	–	Work Accomplished Code
WBS	–	Workload Breakdown Structure
WDC	–	When Discovered Code
WRM	–	War Reserve Materiel (War Readiness Materiel)
WRSK	–	War Reserve Spares Kit (War Readiness Spares Kit)
W/W	–	World Wide
XR	–	Directorate of Plans and Resources

7-2. TERMS AND DEFINITIONS.

a. Data Element Definitions.

(1) Job Control Number/Report Number – A unique number assigned and used to control and tie together every related task required to accomplish a job. Each related set of symptoms that comprises a single task or discrepancy is defined as a job. All actions taken to make the fix, whether on the line or at a base shop or other major intermediate repair facility, are considered part of the job and must carry the same number.

(2) Work Center – A five-digit code that identifies organizational elements to which maintenance personnel are assigned, or locations to which they may be dispatched.

(3) Date, This Report – Year, month, and day (may be written day, month, year) the report was initiated. This information is used in determining elapsed time in completing the total actions relating to a single job control number, i.e., all actions from the line, base shop, and depot.

(4) Activity Identification – Identification of the base in possession of an item.

(5) End Item (EI) Identification – An alphanumeric designator that identifies an item as a specific type, model, and series; or mission, design, and series. This identification can be the same as the Standard Reporting Designator (SRD) used with data products from the Standard Base Supply System, U1050-II.

(6) Serial Number EI – A unique number assigned to individual items within an end item identification scheme.

(7) Possessed Time EI – That interval of time that an item is specifically assigned to an operational organization for the accomplishment of assigned missions.

(8) Time/Miles/Cycles/Events EI – A record of the operating life of a serial numbered end item in units of time, miles, cycles, events (as applicable for the item) at the time of failure or maintenance action.

(9) Number of Landings EI – A record of the number of landings made by a specific aerospace vehicle.

(10) Number of Sorties EI – The cumulative number of flights of a single aerospace vehicle.

(11) Date of Mission – The year, month, and day a given mission was started.

(12) Start of Mission (Time) – The clock time at the start of a given mission.

(13) End of Mission (Time) – The clock time at the end of a given mission.

(14) Mission Type – A unique code identifier for the type of mission being accomplished when a malfunction occurred.

(15) Operating Mode/Mission Phase – A unique code identifying the mode of operation and/or the mission phase during which the malfunction occurred.

(16) Time in Each Mode/Phase – The intervals of time that items operate in each mode or phase.

(17) Manufacturer Failed Item (FI) – Identification of manufacturer by name or code, as provided in the Federal Stock Catalog.

(18) Serial Number FI – A unique number assigned to individual items within a functional group that distinguishes one item within that group from another.

(19) Part Number FI – Manufacturer's number assigned to individual items or equipment, used in conjunction with manufacturer and serial number to track a selected item.

(20) Time/Miles/Cycles/Events FI – A record of the operating life of a failed item.

(21) Work Unit Code (WUC) – A five-digit coding structure that identifies an item on which maintenance is performed; usually assigned only to repair cycle assets.

(22) When Discovered Code, Date and Time – A unique code designed to identify the mode of operation or the phase of maintenance when a discrepancy is detected, along with the day, month, year, and clock time of the detection.

(23) How Malfunctioned Code – A code that describes the physical defect of an item undergoing maintenance, as determine by the person performing the maintenance. This code is used by AFLC in conjunction with action taken codes to determine failures. At the base level, only how malfunctioned codes are used to identify failed items.

(24) Action Taken Code – A code that describes the type of maintenance action accomplished or in progress.

(25) Description of Problem – A narrative description of the problem, addressing what comprises the malfunction.

(26) Corrective Action (Maintenance Action Taken) – A narrative description of the maintenance actions performed to repair the failed item.

(27) Piece Parts Replaced – A listing of the failed items removed from and replaced in an assembly to restore it to a functional condition. Only part numbered items or items with a National Item Identification (NIIN) are listed.

(28) Units Completed – The number of like items worked on and actions completed for a given WUC.

(29) Manufacturer Installed Item (II) – Same as item (17).

(30) Serial Number II – Same as item (18).

(31) Part Number II – Same as item (19).

(32) Time/Miles/Cycles/Events (II) – A record of the operating life of the installed item.

(33) Air Force Specialty Code (AFSC) – A unique identifier that indicates a person's area of specialization and skill level associated with that specialty.

(34) Crew Size (by AFSC) – The number of maintenance personnel by Air Force Specialty Code performing a maintenance action.

(35) Start Time (Maintenance) – The actual clock time, to the nearest 5 minutes, at which a maintenance action was initiated.

(36) Stop Time (Maintenance) – The actual clock time, to the nearest 5 minutes, at which a maintenance action was terminated for any reason in excess of 15 minutes.

(37) Delay Code – A unique identifier indicating that a maintenance task has been delayed for some particular reason.

(38) Support, General Maintenance – A coding structure that identifies support-type maintenance actions such as servicing, inspection, towing, washing, cleaning, corrosion prevention, handling, preservation and depreservation of equipment, preparation of records and publications, and shop support functions. WUCs 01XXX through 09XXX are included in this category.

(39) Non-Support, General Maintenance – A coding structure that identifies corrective maintenance actions on specific WUCs, as well as other maintenance actions not classified as support types. Included are WUCs 11XXX through 99XXX.

(40) Type Maintenance Code – A one-character code used to identify the type of work accomplished.

b. Parameter Definitions.

(1) Mean Time Between Failures (MTBF) – For a particular time interval, the total operating life of a population of a part, component,

subassembly, assembly, subsystem, or system divided by the total number of failures within the population. This definition holds for operating time, flying time, sorties, events, or other measures of the life units to be applied when the system operational reliability is being evaluated. It is the average operating interval between malfunctions or degraded conditions that require corrective maintenance.

(2) Failure Rate – The number of failures of an item per unit measure of life (cycles, time, miles, events, etc., as applicable for the item). For equipment exhibiting an exponential failure distribution, failure rate is the reciprocal of MTBF.

(3) Malfunction Occurrence Rates (DO56B5527).

(a) Total Maintenance Actions/1000 Flight Hours are all occurrences reported under all valid how malfunctioned codes of types 1, 2, and 6, and action taken codes E, F, H, J, K, L, P, R, S, U, X, and Z. (See appendix 4-2A for information concerning these codes.)

(b) Aborts/1000 Flight Hours are expressed as a ratio based upon reported actions from "on" equipment maintenance information. They are divided into ground and flight occurrences.

(c) Total Aborts/1000 Sorties Flown is expressed as a rate based upon actions from "on" equipment maintenance information covering when discovered codes A and C.

(d) Failure Occurrences/1000 Operating Hours is expressed as a rate based on occurrences reported against equipment that operates over a time interval.

(4) Percent Failures by When Discovered Code (DO56B5527).

(a) Before-Flight failure occurrences are accumulated for when discovered codes A and B as a fraction of total occurrences, and converted to a percentage.

(b) In-Flight failure occurrences are accumulated for when discovered codes C and D as a fraction of total occurrences, and converted to a percentage.

(c) Between-Flight failure occurrences are accumulated for when discovered codes E, F, G, H, J, N, V, and 3 as a fraction of total occurrences, and converted to a percentage.

(d) During-Inspection failure occurrences are accumulated for when discovered codes K, M, P, Q, R, T, U, W, X, Z, 2, and 4 as a fraction of total occurrences, and converted to a percentage. (Note that failures discovered during basic postflight, preflight, and home-station checks are identified in the between-flight category.)

(5) Mission Reliability – The percentage of attempted sorties flown without abort.

(6) Maintenance Man-Hours/Flight Hour – The amount of direct maintenance labor expended per unit of time the aerospace vehicle is flown. This parameter may include all support general and nonsupport general

man-hours or only 03XXX and 04XXX coded support general and nonsupport general man-hours (see appendix 4-2A).

(7) Maintenance Man-Hours/Operating Hour – The amount of direct maintenance labor expended per unit of time the equipment is operated.

(8) MTTR – The total corrective maintenance time divided by the total number of corrective maintenance occurrences during a given period of time. This parameter is expressed in clock hours.

(9) MMTR – The total corrective maintenance man-hours divided by the total number of corrective maintenance occurrences during a given time period.

(10) Mean Time Between Maintenance – The mean of the distribution of the time intervals between maintenance actions.

(11) Mean Active Downtime – The average clock hours between sorties when an aerospace vehicle is not flying, or the average clock hours that an equipment is not operating because of scheduled and unscheduled maintenance, servicing, supply, and administrative delays.

(12) Not Operationally Ready, Maintenance-Grounded (NORM-G) – The aerospace vehicle requires maintenance that must be performed (scheduled or unscheduled) prior to flight. This category includes the "look and fix" phase of maintenance inspection or Time Compliance Technical Order, as well as after a preflight, through flight, home station check, or basic postflight inspections.

(13) Not Operationally Ready, Maintenance-Flyable (NORM-F) – The aerospace vehicle can be flown, but is not capable of performing all of its command assigned missions due to one or more of its command designated systems or subsystems being inoperative. In addition, maintenance must either be in progress or have been deferred for reasons other than lack of parts or supplies.

(14) Not Repairable This Station (NRTS) – A code for off equipment actions that indicates reasons for not accomplishing repairs at the base level maintenance facility. From a maintainability point of view it represents maintenance man-hours expended in determining disposition of the item even though repair was not accomplished.

(15) Built-In Test Effectiveness – The adequacy and accuracy exhibited by the built-in test equipment with respect to detecting and isolating faults.

(16) Actuarial Life Expectancy – The operating time (flying time) that can be expected from an item before it fails or before it must be removed and overhauled to bring it back to a like-new condition.

(17) Operationally Ready Rate – The fraction of time within some specified calendar period, that an item is capable of performing all its assigned missions.

(18) Aircraft Utilization Rate (Sortie Rate) – The amount of time/ sorties that an item is performing its assigned missions, within some specified calendar time period.

(19) Item On-Line (Uptime) – That interval of time during which an item is on standby, on alert, reacting to, or performing a mission.

(20) Not Operationally Ready, Supply-Grounded (NORS-G) – The aerospace vehicle is not capable of flight due to a verified lack of parts. This condition is applicable only if a NORS demand has been placed on supply and verified in accordance with standard procedures.

(21) Not Operationally Ready, Supply-Flyable (NORS-F) – The aerospace vehicle can be flown, but is not capable of performing all its command assigned missions due to one or more of its Command-designated systems or subsystems being inoperative and parts are required to return it to a fully operational status. This condition must be verified as for a NORS-G designation.

(22) Repair Capability – The percentage of components delivered to the base-level maintenance function for repair that are actually repaired (repaired units plus action taken codes 2 through 6).

(23) Reparable Repair Rate – The percentage of components assigned to base level maintenance for repair that are actually repaired (repaired units plus action taken codes 1 through 9).

(24) Bench Check Serviceable Rate – The percent of items, removed from the end item for which the suspected failure was not confirmed during bench check using available skills, test equipment, and technical data.

(25) Could Not Duplicate Rate – The percentage of reported on-equipment malfunctions checked and found to require no further maintenance action.

(26) Mean Time Between Demand – The average operating time between removals of components for suspected failure, with failure confirmed during bench check.

(27) AGE Utilization Rate – The average hours per month that aerospace ground equipment is operated.

(28) Support Equipment Maintenance Man-Hours per Operating Hour – The direct maintenance labor spent on maintenance of support equipment (AGE) per unit of equipment operating time.

(29) Precision Measuring Equipment (PME) No Defect Rate – The percentage of instances that PME are found to be defect-free during scheduled calibration, compared with the total number of PMEs calibrated over some time span.

(30) Requisition Fill Rates – The percentage of instances that requisitions for components, modules, repair parts, consumables, etc., are filled by base supply within prescribed time limits, compared with the total number of requisitions presented to base supply over some finite time span (weeks, months, etc.).

(31) Cannibalization Rate – A measure of the on-equipment cannibalization actions performed to keep an end item in an operationally ready condition. The rate is expressed as average cannibalizations per sortie.

(32) Maintenance Plan and Support Concept Adequacy – How well the maintenance plan and support concept fulfills the needs of an end item to sustain an operationally ready rate.

(33) Supply Support Adequacy – The capacity of supply support planning and implementation to sustain base-level maintenance requirements.

(34) Transportation/Handling Adequacy – The sufficiency of the planning and implementation factors associated with transportation and handling to satisfy end item support requirements.

(35) Technical Data Adequacy – Adequacy of technical data to support end item maintenance and operation.

(36) Test and Support Equipment Adequacy – The capability test and support planning and equipment to sustain end item operations.

(37) Support Facilities Adequacy – The capacity of available support facilities to sustain end item operation.

(38) Training Adequacy – The sufficiency of the training received or planned for operation, checkout, and maintenance of an end item.

(39) Initial and Replacement Spares Adequacy – The sufficiency, with respect to sustaining an end item operationally ready rate, of planned and implemented initial and replacement parts stockage levels for maintenance and repair. (May be considered an element of Supply Support.)

(40) Configuration Management Adequacy – The adequacy of the configuration management planning and the practices developed and implemented for an end item.

(41) Discrepancies per Scheduled Inspection.

(a) Preflight rates are calculated for occurrences with when discovered code J.

(b) Thru- and basic post-flight rates are calculated for occurrences with when discovered code H.

(c) Phase, isochronal, etc., rates are calculated for occurrences with when discovered code K, M, 3, and 4.

(42) Percent Scheduled Inspection Man-Hours – The percentage of total man-hours expended against when discovered codes H, J, K, M, 3 and 4.

c. Other Definitions.

(1) Failure.

(a) The DO56 Data System's definition describing a failure occurrence at the five-position work unit code level is:

1. Any type 1 how malfunctioned code in combination with an action taken code of F, K, L, or Z.

2. Any type 1 how malfunctioned code in combination with an action taken code of P or R, provided that the removed item was not found serviceable (action taken code B) at the bench check station.

NOTE: A listing of how malfunctioned and action taken codes is provided in appendix 4-2A.

(b) The criteria describing a failure occurrence and the accumulation of failures for use in evaluating data at the system/subsystem level (74XXX/741XX) are the same as para. 7-2c(1)(a), plus action taken code G reported in combination with any type 1 how malfunctioned code. Accumulation of failure occurrences as related to action taken code G for evaluation at the system/subsystem level (74XXX/741XX) is further limited to a count of one per job control number after first qualifying as an occurrence.

(c) MDC Failure Categories.

1. CODE A DATA CLASS – FAILURE. An on-equipment record containing a how malfunctioned code other than those listed for codes B, C, or D below. Only code A is used in determining failure data for the performance monitoring system. These how malfunctioned codes are included in the failure count unless combined with action taken code Q or Y.

2. CODE B DATA CLASS – INDUCED FAILURE. An on-equipment record containing how malfunctioned code 086, 092, 105, 106, 108, 158, 167, 204, 230, 246, 301, 303, 447, 424, 518, 553, 602, 638, 639, 697, 698, 709, 731, 750, 877, 878, 931, or 942. Code B records are not included in the high-25 on-equipment failure, PCN SGØØ1B781.

3. CODE C DATA CLASS –NON-FAILURES. An on-equipment record containing how malfunctioned code 142, 143, 632, 796, 799, 800, 803, 805, 812, 948, or 804 and type maintenance not "T" or "Z". Also

included are how malfunctioned codes A or B in combination with action taken codes Y or D. (Note: DO56 includes codes 142 and 143 as type 1 failures.)

4. CODE D DATA CLASS – NO DEFECT, TCTO. An on-equipment record containing type maintenance code "T" or "Z" and how malfunctioned code 793, 797, 798, 801, 802, 804 or 911. (Note: See appendix 4-2A for MDCS data class codes and how malfunctioned codes.)

(2) Other Malfunctions (DO56). Other malfunction occurrences are defined as:

(a) Any type 1 how malfunctioned code in combination with an action taken code G at the five-position work unit code level. At the system/subsystem (74XXX-741XX) level, a type 1 how malfunctioned code with an action taken code G is accumulated and shown as a failure and not as another malfunction.

(b) Type 2 how malfunctioned code and all action taken codes listed in para. 7-2c(1)(a) and (b).

NOTE: The definitions in this paragraph apply to DO56B5505, DO56B5006, and DO56B5527 products.

(3) Total Occurrences (DO56) – On-equipment occurrences are reported under all valid how malfunctioned codes (types 1, 2, and 6) and all action taken codes listed in para. 7-2c(1)(a) and (b), above, plus E, H, J, S, V, and X. This expression is used in the DO56B5006 for MTBF. Time change events are included.

(4) Before Flight Abort – For an attempted sortie that does not become airborne because of a failure, the criteria used will be that applied by the predominant using command for operational forces. For example, in TAC an abort occurs when an aircraft fails to take off within 2 hours of scheduled takeoff time due to maintenance discrepancies or other causes discovered or occurring after scheduled aircrew station time. For determining aborts, the scheduled takeoff time for aircraft is that agreed upon by maintenance and operations prior to crew arrival.

(5) Inflight Abort – An airborne aircraft cannot effectively accomplish its primary or alternate scheduled mission due to a reported malfunction.

(6) Flight Hours – The accumulation of all flying hours readings for some specified period of time.

(7) Use Factor – The ratio of item operating time to flying time.

(8) Quantity Per Application (QPA) – The number of identical items of the work unit code installed on the specified aircraft/end item.

(9) Quantity of Failure Occurrences – The accumulation of failure occurrences during the same period covered by the operating time.

(10) Special Inventory – Accommodates different configurations when all test aircraft end items are not equipped with one or more particular work unit coded components.

(11) Aircraft/End Item Inventory – The number of aircraft/end items under test.

(12) Operating Time – The accumulation of actual hours that an item is in operation based on ETI readings, or possessed time for that item. When information is available, NOR grounded time may be subtracted from possessed time to determine operating time, when operating time is not reported separately.

(13) Test Inventory – The total number of items under test.

(14) On-Equipment Man-Hours (DO56) – The sum of all on equipment labor expended except support general.

(15) Off-Equipment Man-Hours, or Shop Hours (DO56) – The sum of all off-equipment labor expended in work unit code series 11XXX through 99XXX. Excluded are support general, depot, and items withdrawn from supply (when discovered code Y) actions.

(16) Total Man-Hours (DO56) – The sum of all on-equipment and off-equipment maintenance man-hours as defined in para. 5-2c(14) and (15) above.

(17) On-Equipment Man-Hours (Except DO56) – The sum of on-equipment labor expended for all support general work unit codes and all on-equipment labor expended on work unit codes requiring preventive and corrective maintenance actions.

(18) Off-Equipment Man-Hours (Shop Hours, except DO56) – The sum of all off-equipment labor expended for all support general work unit codes and all off-equipment labor expended on work unit codes requiring corrective maintenance actions.

(19) Total Man-Hours (Except DO56) – The sum of all on-equipment and off-equipment maintenance man-hours as defined in para. 5-2c(17) and (18) above.

(20) Total Corrective Maintenance Man-Hours – The sum of all off- and -on equipment maintenance man-hours expended on work unit codes 11XXX through 99XXX) requiring corrective maintenance actions.

(21) Total Corrective Maintenance Occurrences – The sum of the unit count for all type 1 and 2 how malfunctioned codes in combination with action taken codes A, F, G, K, L, P, R, V, and Z.

(22) Total Turnaround Hours – The sum of all scheduled and unscheduled on-equipment maintenance time, supply and administrative delay time, dead shift time, inspections, servicing and loading time. All time is expressed in clock hours.

(23) NORM-G Hours – The sum of NORM-G scheduled and unscheduled hours for the test inventory over the time period being evaluated.

(24) Total NORM Hours – The sum of NORM-G unscheduled hours, NORM-G scheduled hours, and NORM-F hours for the test inventory over the time period under evaluation.

(25) Aircraft Hours Possessed – The sum of the total clock hours accumulated for the test inventory during the time period associated with the evaluation.

(26) Quantity of Maintenance Occurrences – The sum of the on-equipment unit count for all how malfunctioned codes (types 1, 2, and 6) in combination with action taken codes E, F, G, H, J, K, L, P, R, S, V, X, and Z during the same time period covered by the operating time with the "type maintenance code" criteria of para. 4-4b(1)(n)1 applied.

(27) Total NRTS Man-Hours – The sum of all off-equipment man-hours accumulated for action taken codes 1 through 9.

(28) Malfunctions Detected/Isolated – The sum of the successful attempts of the BIT to detect/isolate malfunctions over some specific time period.

(29) Total Malfunctions Indicated – The sum of all malfunctions indicated by the BIT for the same time period.

(30) Total Units With No Defect Found – The sum of the unit count for all BIT-indicated failures with action taken code H, or a combination of action taken codes P and R with action taken code B.

(31) Item Reaction Time – The fraction of possessed time needed to initiate a mission, measured from the time the command is received.

(32) Item Standby Time – The fraction of possessed time that an aerospace vehicle or end item is considered ready to be operated, but has not been activated for operation. Items that fall into this category include, but are not limited to, AGE and CEM.

(33) Item Alert Time – The fraction of possessed time that an aerospace vehicle is in an operating condition and is ready to perform its specified mission when called upon to so do. This term may be applied to items other than aerospace vehicles if there is indeed an alert condition associated with equipment operations.

(34) Item Downtime – The fraction of possessed time that an end item is not available to perform its mission because of necessary maintenance or supply actions. The sum of scheduled, unscheduled, and delay time associated with these actions comprise downtime. Downtime is applicable to all end items regardless of their operating characteristics.

(35) Total NORS-G Hours – The sum of all NORS-G hours for all aircraft under test over the time span of the evaluation period.

(36) Total NORS Hours – The sum of all NORS-G and NORS-F hours for all aircraft under test over the time span of the evaluation period.

(37) NORS Hours – The sum of all NORS hours for the test inventory over the time period of the evaluation.

(38) Number of Sorties (Hours) Flown – The total number of sorties (hours) flown during the time span of the evaluation.

(39) Number of Maintenance Days – The total number of work days in the time span of the evaluation.

(40) Serviceable Units – The sum of all off-equipment action taken code B units for some specific time period (action taken codes A, F, G, K, L, V, Z).

(41) Repaired Units – The sum of all equipments repaired and returned to an operating conditon over the same period of time.

(42) On-Equipment Could Not Duplicate Actions – The sum of the unit count for action taken codes H and J in combination with when discovered codes A, B, C, D, E, G, N, P, and 2 over some specific time span.

(43) Operator Reported On-Equipment Actions – The sum of the unit count for action taken codes F, G, H, J, K, L, P, R, V, X, and Z in combination with when discovered codes A, B, C, D, E, G, N, P, and 2 over the same specific time span.

(44) Total Demand Actions – The sum of the unit count for on-equipment action taken codes P and R in combination with all type 1 and 2 how malfunctioned codes, less action taken code B combined with how malfunctioned code 799 over some specific time span. (*Note: Time change*, scheduled maintenance, and modification removals are not included.)

(45) No Defects – The number of PME found to be defect free during scheduled calibration accumulated for some specific time period.

(46) Total PME Calibrated – The total number of PME processed for calibration over the same time period.

(47) Requisitions Filled – The sum of requisitions for components, modules, repair parts, consumables, etc., that are filled by base supply/

contractor within prescribed limits over some specific time span. Items withdrawn from an established bench stock are not included.

(48) Total Requisitions – The sum of all requisitions presented to base supply/contractor over the same specific time period.

(49) Cannibalization Actions – The sum of all on-equipment action taken codes T accumulated over some specific time period.

(50) Number Returned to Service (Engines) – The sum of all engines returned to service from base level maintenance over some specific time period.

(51) Total Removals (Engines) – The sum of all engines removed over the same time period.

(52) Scheduled Removals (Engines) – The sum of all engine removals, on a scheduled basis, over the same time period.

(53) Directed Removals (Engines) – The sum of all directed engine removals over the same time period.

(54) End Item – An entity of hardware not to be installed in another piece of equipment.

(55) On-Equipment Actions – Those maintenance actions performed on end items of equipment.

(56) Off-Equipment Actions – Those maintenance actions performed on assemblies, subassemblies or components apart from an end item of equipment.

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